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Johns Hopkins University.

INAUGURATION OF

PRESIDENT GILMAN,

February 22d, 1876.

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ADDRESSES

AT THE INAUGURATION OF

DANIEL C. GILMAN,

AS

President of the Johns Hopkins University,

Baltimore, February 22, 1876.

BALTIMORE:
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET.
1876.

INTRODUCTION.

THE public exercises connected with the Inauguration of the first President of the Johns Hopkins University, were held in the Academy of Music, in Baltimore, Tuesday, February 22d, 1876. His Excellency, the Governor of Maryland; his Honor, the Mayor of Baltimore; the Presidents and representative Professors of a large number of Universities and Colleges; the Trustees and other officers of the scientific, literary and educational institutions of Baltimore; the State and City officers of public instruction and other invited guests, together with the Trustees of Johns Hopkins, occupied the platform. The house was filled with an attentive audience.

At eleven o'clock, the chair was taken by the President of the Trustees, Mr. Galloway Cheston. The orchestra of the Peabody Institute, directed by Professor Asger Hamerik, gave the Overture to "*Alceste*," by Gluck.

A prayer was then offered up by Rev. Alfred M. Randolph, D. D., of Emmanuel Church; after which the Chairman of the Executive Committee, Mr. Reverdy Johnson, Jr., said:

"Our gathering to-day is one of no ordinary interest. From all sections of our State, from varied sections of our land, we have met at the opening of another avenue to social progress and national renown. After two years of pressing responsibility and anxious care the Trustees of the Johns Hopkins University, present the first detailed account of their trust. Of the difficulties attending the discharge of their duty; of the nice balancing of judgment; of the careful investigation and continued labor called for in the organization of the University, this is not the place to speak; but for the Board of Trustees, I may be allowed to claim the credit of entire devotion to the work, and a sincere

desire to make of the University all that the public could expect from the generous foundation. Happily, our action is unfettered, and where mistakes occur, as occur they must, the will and power are at hand to correct them. We may say that the University's birth takes place to-day, and I do not think it mere sentiment, should we dwell with interest upon its concurrence with the centennial year of our national birth, and the birth day of him who led the nation from the throes of battle to maturity and peace. But it is not my province to detain you from the exercises which are to follow. I am happy to state that we have among us to-day one who represents the highest type of American education, and one who, from the beginning has sympathized with, counselled and aided us. I know you anticipate me, as I announce the distinguished name, from the most distinguished seat of learning in our land—President Eliot, of Harvard University."

President Eliot next delivered a Congratulatory Address.

Beethoven's Concert Overture, "*The Consecration of the House*," (C maj., op. 124,) having been performed by the Orchestra, Mr. Reverdy Johnson, Jr., introduced President Gilman, remarking, as he did so, that the University now stands forth baptized with ancient Harvard as its sponsor.

President Gilman then delivered the Inaugural Address.

At its conclusion, the Orchestra gave Weber's "*Jubilee Overture*," (E maj., op. 59.)

The benediction was pronounced, and at half past one, the assembly dispersed.

CONGRATULATORY ADDRESS

BY

CHARLES W. ELIOT, LL.D.,

President of Harvard University.

PRESIDENT ELIOT'S ADDRESS.

THE oldest University of the country cordially greets the youngest, and welcomes a worthy ally—an ally strong in material resources and in high purpose.

I congratulate you, gentlemen, TRUSTEES OF THE JOHNS HOPKINS UNIVERSITY, upon the noble work which is before you. A great property, an important part of the fruit of a long life devoted with energy and sagacity to the accumulation of riches, has been placed in your hands, upon conditions as magnanimous as they are wise, to be used for the public benefit in providing for coming generations the precious means of liberal culture. Your Board has great powers. It must hold and manage the property of the University, make all appointments, fix all salaries, and, while leaving both legislative and administrative details to the several faculties which it will create, it must also prescribe the general laws of the University. Your cares and labor will grow heavy as time goes on; but in accordance with an admirable usage, fortunately established in this country, you will serve without other compensation than the

public consideration which will justly attach to your office, and the happy sense of being useful. The actuating spirit of your Board will be a spirit of scrupulous fidelity to every trust reposed in you, and of untiring zeal in promoting the welfare of the University and the advancement of learning. Judged by its disinterestedness, its beneficence, and its permanence, your function is as pure and high as any that the world knows, or in all time has known. May the work which you do in the discharge of your sacred trust be regarded with sympathetic and expectant forbearance by the present generation, and with admiration and gratitude by posterity.

The University which is to take its rise in the splendid benefaction of Johns Hopkins must be unsectarian. None other could as appropriately be established in the city named for the Catholic founder of a colony to which all Christian sects were welcomed, or in the State in which religious toleration was expressly declared in the name of the Government for the first time in the history of the Christian world. There is a too common opinion that a college or university which is not denominational must therefore be irreligious; but the absence of sectarian control should not be confounded with lack of piety. A university whose officers and students are divided among many sects need no more be irreverent and irreligious

than the community which in respect to diversity of creeds it resembles. It would be a fearful portent if thorough study of nature and of man in all his attributes and works, such as befits a university, led scholars to impiety. But it does not; on the contrary, such study fills men with humility and awe, by bringing them on every hand face to face with inscrutable mystery and infinite power. The whole work of a university is uplifting, refining and spiritualizing: it embraces

> "whatsoever touches life
> With upward impulse; be He nowhere else,
> God is in all that liberates and lifts;
> In all that humbles, sweetens and consoles."

A university cannot be built upon a sect, unless, indeed, it be a sect which includes the whole of the educated portion of the nation. This University will not demand of its officers and students the creed, or press upon them the doctrine of any particular religious organization; but none the less—I should better say, all the more—it can exert through high-minded teachers a strong moral and religious influence. It can implant in the young breasts of its students exalted sentiments and a worthy ambition; it can infuse into their hearts the sense of honor, of duty, and of responsibility.

I congratulate the city of Baltimore, MR. MAYOR, that in a few generations she will be the seat of a rich and powerful university. To her citizens its

grounds and buildings will in time become objects of interest and pride. The libraries and other collections of a university are storehouses of the knowledge already acquired by mankind, from which further invention and improvement proceed. They are great possessions for any intelligent community. The tone of society will be sensibly affected by the presence of a considerable number of highly educated men, whose quiet and simple lives are devoted to philosophy and teaching, to the exclusion of the common objects of human pursuit. The University will hold high the standards of public duty and public spirit, and will enlarge that cultivated class which is distinguished, not by wealth merely, but by refinement and spirituality.

I felicitate the STATE OF MARYLAND, whose CHIEF MAGISTRATE honors this assembly with his presence, upon the establishment within her borders of an independent institution of the highest education. The elementary school is not more necessary to the existence of a free State than the University. The public school system depends upon the institutions of higher education, and could not be maintained in real efficiency without them. The function of colleges, universities and professional schools, is largely a public function; their work is done primarily, indeed, upon individuals, but ultimately for the public good. They help powerfully to form and mould aright

the public character; and that public character is the foundation of everything which is precious in the State, including even its material prosperity. In training men thoroughly for the learned professions of law and medicine, this University will be of great service to Maryland and the neighboring States. During the past forty years the rules which governed admission to these honorable and confidential professions have been carelessly relaxed in most of the States of the Union, and we are now suffering great losses and injuries, both material and moral, in consequence of thus thoughtlessly abandoning the safer ways of our fathers. It is for the strong universities of the country to provide adequate means of training young men well for the learned professions, and to set a high standard for professional degrees.

President Gilman, this distinguished assembly has come together to give you God-speed. I welcome you to arduous duties and grave responsibilities. In the natural course of life you will not see any large part of the real fruits of your labors; for to build a university needs not years only, but generations; but though "deeds unfinished will weigh on the doer," and anxieties will sometimes oppress you, great privileges are nevertheless attached to your office. It is a precious privilege that in your ordinary work you will have to do only with men of refinement and honor; it is a

glad and animating sight to see successive ranks of young men pressing year by year into the battle of life, full of hope and courage, and each year better armed and equipped for the strife; it is a privilege to serve society and the country by increasing the means of culture; but, above all, you will have the great happiness of devoting yourself for life to a noble public work without reserve, or stint, or thought of self, looking for no advancement, "hoping for nothing again." Knowing well by experience the nature of the charge which you this day publicly assume, familiar with its cares and labors, its hopes and fears, its trials and its triumphs, I give you joy of the work to which you are called, and welcome you to a service which will task your every power.

The true greatness of States lies not in territory, revenue, population, commerce, crops or manufactures, but in immaterial or spiritual things; in the purity, fortitude and uprightness of their people, in the poetry, literature, science and art which they give birth to, in the moral worth of their history and life. With nations, as with individuals, none but moral supremacy is immutable and forever beneficent. Universities, wisely directed, store up the intellectual capital of the race, and become fountains of spiritual and moral power. Therefore our whole country may well rejoice with you, that you are auspiciously founding here a worthy seat

of learning and piety. Here may young feet, shunning the sordid paths of low desire and worldly ambition, walk humbly in the steps of the illustrious dead—the poets, artists, philosophers and statesmen of the past; here may fresh minds explore new fields and increase the sum of knowledge: here from time to time may great men be trained up to be leaders of the people; here may the irradiating light of genius sometimes flash out to rejoice mankind; above all, here may many generations of manly youth learn righteousness.

INAUGURAL ADDRESS

BY

DANIEL C. GILMAN,

President of the Johns Hopkins University.

INAUGURAL ADDRESS.

IF this assembly, with one voice, could utter the thought now uppermost, there would be a deep, quick, hearty acknowledgment of the bounty of JOHNS HOPKINS.

His beneficence, so free, so great, so wise, promoting at once the physical, intellectual and moral welfare of his fellow-men, awakens universal surprise and admiration, and calls for our perpetual thanks.

In respect to the giver, I can say but little to you, the citizens of Baltimore, who knew him so well; who remember his industry, sagacity and intellectual force; who have tested his integrity, and found that his word was as good as his bond; who recall his fore-sight, his enterprise, and his belief in the future of this city and state; who recollect that more than once in financial crises he hazarded his own fortune for the protection of others; who heard, it may be from his own lips,

the motives and hopes which prompted these royal gifts; who believe that great acquisitions involve great responsibilities, but who know how hard it was for one long accustomed to power to yield that power to others; to you, his fellow-citizens, who saw the steps by which this benefactor toiled upward to the temple of Fortune, and there unsatisfied, went higher, by more arduous steps, to the temple of Charity, where he bestowed his gifts.

While I leave to others the commemoration of our founder, you must let me refer to the tributes of admiration which his generosity has called out on the remotest shores of our own land, and in the most venerable shrines of European learning. The Berkeley laurel and the Oxford ivy may well be carved upon his brow when the sculptor shapes his likeness; for by wise men in the east and by rich men in the west, his gifts are praised as among the most timely, the most generous, and the most noble ever bestowed by one, for all.

The genesis of American munificence is a bright chapter of our history. From the days of the Puritan minister, who gave his name to our oldest University, and the days of the London merchant, who endowed the second college in New England, each generation has surpassed its predecessors. It is a striking coincidence that among the very earliest names on this heraldic roll, is that which

our foundation bears. The schools which Edward Hopkins, a colonial governor, established in 1660, by his will, and his gifts to Harvard, still keep alive his name and influence. So may the name of our founder live for more than two hundred years to come, and his gifts be immortal. Johns Hopkins might have used the very words of Edward Hopkins, who desired to bestow "some encouragement for the breeding up of hopeful youths, for the public service of the country in future times."

We may conjecture a spiritual if not a physical descent in the line of Hopkins. In 1676, the name is written on the door of an endowed grammar school at New Haven, older than Yale, and second only to Harvard; in 1776, the name is signed to the Declaration of Independence; in 1876, it distinguishes a University foundation. To our cotemporary, we may apply the words with which the deeds of the colonial governor are recounted. After saying that his last will is an interesting monument of private friendship and public spirit, that friends and domestics were not forgotten, that his public gifts were "for the promotion of religion, science and charity," the historian adds this eulogy: "*Thus did this lofty and intellectual spirit devise and distribute blessings in his own age, and by his wisdom, prepare and make them perpetual for succeeding times.*"

The Endowment.

The total amount of the public gifts of Johns Hopkins, is more than seven million dollars. The sum of $3,500,000 is appropriated to a university; a like sum to a hospital; and the rest to local institutions of education and charity. Let us compare these benefactions with some others. Thirty years ago, when the gift of Abbott Lawrence to Harvard College was made known it was said to be "the largest amount ever given at one time during the life time of the donor to any public institution in this country,"—the amount was $50,000; the gift of Smithson, so well administered in Washington, amounted to over half a million; the foundation of Stephen Girard surpassed two million dollars.

You may see from these figures what great munificence has brought us together. So far as I can learn, the Hopkins foundation, coming from a single giver, is without a parallel in terms or in amount in this or any land. But beware of exaggeration. These gifts are often spoken of as if the whole, instead of the half, was intended for the university, and then as if an equal amount was given to the hospital; and so it happens that dreams of monumental structures and splendid piles and munificent salaries flit through the mind

which can never become real. Do not forget how much wealth is accumulated by older colleges—in repute, experience and influence, and also in material things. The property of Harvard College is more than five million dollars; that of Yale must equal our endowment. The land investments of a university in the Northwest are said to exceed these values; and Ezra Cornell, while he lived, expected that the endowments at Ithaca would approach, if not surpass, the funds of Harvard. The income yielding funds of Harvard in 1875 were over three millions; those of Yale near a million and a half. Even these figures look small compared with the accumulations of Oxford and Cambridge.

Now turn our capital into income. Our university fund yields a revenue of nearly $200,000. Let us compare this amount with the resources of our two richest colleges. Harvard, in 1874–5, (in all departments), received from tuition $168,541.72; from property, $218,715.30; a total of $387,257.02. The college alone, not including the library, the general administration, or any of the special departments, cost $187,713.20, which is nearly our whole income. Yale College reports its academical expenses (i. e., exclusive of those in the scientific, theological, law, medical and art departments), in 1874–5, as $126,073.56.

But all our revenue is not at once available; for, as the capital cannot be spent for buildings, some income must be reserved for this. Of course, the buildings will be good and costly. If now we deduct from our income, as a building fund, one hundred thousand dollars annually, it will take several years to accumulate the requisite amount. Of that which remains a large sum will be absorbed by taxation, administration and the purchase of books, instruments and collections. Thus it is evident that the educational income at present is not large. Its expenditure requires great discretion and prudence. The trustees are men of liberal views in respect to professional salaries, but they see as clearly as a schoolboy sees through a problem in short division that the larger the divisor, the less the quotient; the more salary, the less chairs; the more eminent and costly the teachers, the fewer can be secured. I wish that every one who sees the need of a great university, and who knows the range of human science, would take a pencil and distribute our income in the departments which he would like to see promoted here. If his experience is like mine, he will find that before his pencil has half gone down the column of the sciences, the income has been twice expended.

I fear that these remarks are a little ungracious, and I would gladly repress them; but the private and public utterances of thoughtful men have been

so vague as to what it is possible for the trustees of this university to accomplish at once, and our friends are so very generous in their expectations that I feel compelled, at the very outset, to utter a word of caution. If our physicists could bring us "Aladdin's lamp," or our chemists produce "the philosopher's stone," or our merchants give us "the widow's cruse," our aspirations should not be checked by our restricted means; but, till the original benefaction is supplemented by other gifts, or the growth of Baltimore increases the value of our present investments, we must be contented with good work in a limited field.

Its Five-Fold Advantages.

To many the magnitude of our founder's bounty seems its principal value; that is, in fact, but half its glory. With a self-renunciation which is rare and noble, he attached to the gift no burdensome condition or personal whim. The almoners of his bounty are restrained by no shackles bequeathed by a departed benefactor, as they enter upon their course bearing in the one hand the ointment of charity and in the other the lamp of science. His trustees are free—free to determine principles, to decide upon methods, to distribute income, to select professors, to summon students, and even to alter,

from time to time, their own plans—as the enlightenment of the world bestows its radiance upon their undertaking.

In selecting trustees the choice of our founder fell upon those of his friends and acquaintances whom he believed would be free from a desire to promote, in their official action, the special tenets of any denomination or the platform of any political party. In a land where almost every strong institution of learning is either "a child of the church" or "a child of the state," and is thus liable to political or ecclesiastical control, he has planted the germ of a university which will doubtless serve both church and state the better because it is free from the guardianship of either. It was his wish—it is our wish—that here should be a seat of learning so attractive that at its threshold students would gladly cease to discuss sectarian animosities and political prejudices, in their eagerness for the acquisition of Knowledge and their search for Eternal Truth. As in olden time the courtier's and the peasant's sons laid aside their distinctive costumes when they donned the academic dress, let us hope that here the only badges will be those which mark the scholar.

Another advantage attends our foundation. It is established in a large town, in an old state, near to the financial and the political Capitals of the Republic; and at the junction of national high-

ways which connect the North and the South, the East and the West. This is in fact a metropolis or middle city. Such geographical considerations will surely affect our future. Baltimore, moreover, is prepared for this foundation. Professional schools of law, medicine and theology already attract large numbers of students. Technical instruction in the useful arts is to some extent provided in the Maryland Institute. The votaries of the natural sciences are associated in an Academy, which only needs an endowment to enable it to take rank with kindred societies elsewhere. The city, with a liberality which is praised at home and abroad, maintains two excellent high schools for young ladies, and for young men a City College, so well organized, so well taught and so well supported, that it relieves our foundation of doing much which is called "collegiate" in distinction from "university" work. There are good private schools. There are excellent collections of paintings and rare opportunities for the study of music, both as a science and an art. More than all this the foundation of George Peabody, in which a capital of a million and a quarter of dollars is forever set apart for the promotion of culture, has now, with increasing strength, survived the perils of infancy, and gained a place among the very best establishments to be found in any part of our land. Its library is extraordinary for our country;

not because of its size, (some 60,000 volumes) but because it has been selected with an experienced eye, among the most modern and most useful of the publications of the world.

The advantage which will come to the new University in its medical department from the establishment of a hospital, on a separate but allied foundation, is most obvious. Obvious though it is, the most enlightened can not over-estimate its value. If so large a sum as the hospital fund ($3,500,000) were consecrated under any circumstances to the relief of suffering, the promotion of health, and the preservation of life—humanity would rejoice; but when such a foundation is connected with a university, so that on the one hand it commands all the resources of human learning, and on the other makes known through accomplished teachers the results of its experience, we may confidently expect that its influence for good will be more than doubled; that its immediate work in the care of the sick and wounded will be better done than would otherwise be possible; and that its remedial and preventive agencies will extend to thousands who may never come within its walls, but whose ills will be relieved by those taught here.

The timeliness of our foundation is the last of the advantages which I shall name. We begin our work after discussions lasting for a generation

respecting the aims, methods, deficiencies, and possibilities of higher education in this country; after numerous experiments, some with oil in the lamps and some without; after costly ventures of which we reap the lessons, while others bear the loss; after Jefferson, Nott, Wayland, Quincy, Agassiz, Tappan, Mark Hopkins, Woolsey, have completed their official services and have given us their supreme decisions; while the strong successors of these strong men, Eliot, Porter, Barnard, White, Angell and McCosh, are still upon the controversial platform; we begin after the national bounty has for fourteen years, under the far-reaching bill of Senator Morrill of Vermont, promoted scientific education; and after scores of wealthy men have bestowed many million dollars for the foundation of new institutions of the highest sort.

Discussions Elsewhere.

Educational discussions and movements are not restricted to our new country. In old England, questions like these are constantly rife, (in addition to many of purely local interest): How may professorships in the old universities be restored to the dignity or influence, of which they have been in part deprived by the excessive preponderance of collegiate instruction; how may the university in-

fluences be extended to all the large towns; how may science gain a more generous recognition in the ancient seats of learning; how may endowments for research be established without leading to sinecure fellowships; how may ecclesiastical fetters be removed from academic institutions; how may the universities, by their systems of local examinations, best promote the welfare of the preparatory schools, or the training of young persons who are not likely to enter the university; how may the university better provide for the innumerable modern callings, which lie outside of the old "professions" but require an equal culture.

In France, there has not been since the Revolution, I presume, such interest in the promotion of universities as now. I pronounce no opinions, but I call attention to the remarkable law which was passed last year, relinquishing the exclusiveness of a State foundation, and declaring university instruction to be free. Those who have hitherto been oppressed, as they have thought, by a hard law, now seize with alacrity the opportunity to found new institutions, and the offerings of the faithful are freely poured out to restore to the Church those intellectual agencies from which she has been cut off.

At a distance, Germany seems the one country where educational problems are determined; not so, on a nearer look. The thoroughness of the

German mind, its desire for perfection in every detail, and its philosophical aptitudes are well illustrated by the controversies now in vogue in the land of universities. In following, as we are prone to do in educational matters, the example of Germany, we must beware lest we accept what is there cast off; lest we introduce faults as well as virtues, defects with excellence. Some of the ablest men in the new empire are now questioning whether "the Real School" system, after a trial of so many years, is justified of its works—and whether "the gymnasium," somewhat modified, should not be the training place of all who seek a higher culture. Others are questioning whether it is not a mistake to maintain polytechnic schools, and special schools of agriculture, forestry, mining, etc., apart from the universities; and whether it would not be better to combine the higher educational foundations under one direction and in one centre. Some of the best scientific men declare their belief that the university instruction in science, following the gymnastic discipline, is better far as a preparation for what are called the modern pursuits, than the training which is given by the *Real* school and the Polytechnic, and so they assert that an exaggerated value has been attached to technical training.

I only allude to these discussions in passing. It would take many hours to unfold them. But it is well to bear in mind that the most enlightened

institutions in our country, and the most enlightened countries in Europe, are those in which educational discussions are now most lively; and it behooves us, as we engage in a new undertaking, to listen, ponder, and observe; and above all to be modest in the announcement of our plans. It should make the authorities cautious in offering, and the public cautious in demanding a completed scheme for the establishment of a university in Baltimore.

Our caution is none the less needed when we remember that at the present moment Americans are engaged in promoting the institutions of higher education in Tokio, Peking and Beirout, in Egypt and the Hawaiian Isles. The oldest and the remotest nations are looking here for light.

What is the significance of all this activity? It is a reaching out for a better state of society than now exists; it is a dim but an indelible impression of the value of learning; it is a craving for intellectual and moral growth; it is a longing to interpret the laws of creation; it means a wish for less misery among the poor, less ignorance in schools, less bigotry in the temple, less suffering in the hospital, less fraud in business, less folly in politics; it means more study of nature, more love of art, more lessons from history, more security in property, more health in cities, more virtue in the country, more wisdom in legislation, more intelligence, more happiness, more religion.

The Higher Education.

The institutions which are founded in modern society for the promotion of superior education may be grouped in five classes:—1, Universities; 2, Learned Societies; 3, Colleges; 4, Technical Schools; and 5, Museums, (including literary and scientific collections). It is important that the fundamental ideas of these various institutions should be borne in mind.

The University is a place for the advanced special education of youth who have been prepared for its freedom by the discipline of a lower school. Its form varies in different countries. Oxford and Cambridge universities, are quite unlike the Scotch, and still more unlike the Queen's University in Ireland; the University of France has no counterpart in Germany; the typical German universities differ much from one another. But while forms and methods vary, the freedom to investigate, the obligation to teach, and the careful bestowal of academic honors are always understood to be among the university functions. The pupils are supposed to be wise enough to select, and mature enough to follow the courses they pursue.

The Academy, or Learned Society, of which the Institute of France, with its five academies, and the Royal Society of London, are typical examples—

is an association of learned men, selected for their real or reputed merits, who assemble for mutual instruction and attrition, and who publish from time to time the papers they have received and the proceedings in which they have engaged. The University is also an association of learned men, but the bond which holds them together differs essentially from that of the academy. In the universities teaching is essential, research important; in academies of science research is indispensable, tuition rarely thought of.

The College implies, as a general rule, restriction rather than freedom; tutorial rather than professorial guidance; residence within appointed bounds; the chapel, the dining hall, and the daily inspection. The college theoretically stands *in loco parentis;* it does not afford a very wide scope; it gives a liberal and substantial foundation on which the university instruction may be wisely built.

The Technical Schools present the idea of preparation for a specific calling, rather than the notion of a liberal culture. They have in view the imparting of knowledge which will be useful in the practice of a profession, and often set forward as a motive, an assured introduction to the openings which are ready for those who have received their training.

Museums, Galleries and Libraries, (of which the British Museum is the grandest type), are indeed

connected with the other agencies we have named, but they often have an independent existence. They fulfil a two-fold purpose. They preserve and store away the treasures of art, literature and science; and they distribute widely among the people those seeds of culture which are developed by artistic, historic and scientific acquisitions.

Thus we say that the Academy of Sciences promotes the intellectual attrition of the most learned men; the University favors the liberal and special culture of advanced students; the College trains aspiring youth for their future intellectual freedom; the Technical School affords a good preparation for a specific vocation; and the Museum provides materials for study, adapted like the world itself, to interest the most profound and the most superficial.

Now it is clear that we might have a University without the four adjuncts I have named; and we might have the four accessories without the University, but practically wherever a strong University is maintained, these four-fold agencies revolve around it. It is the sun and they are the planets. In Baltimore you have hitherto had a College, an Academy of Sciences, Professional Schools and a Scholars' Library, but you have not had such an endowed University as that which is now inaugurated.

Indeed this new foundation might almost adopt the preamble which John Calvin prefixed to the

statutes of the Academy of Geneva: "Verily hath God heretofore endowed our commonwealth with many and notable adornments, yet hath it to this day had to seek abroad for instruction in good arts and disciplines for its youth, with many lets and hindrances."

But soon I hope we may add what Erasmus said at Oxford: "It is wonderful what a harvest of old volumes is flourishing here on every side; there is so much of erudition, not common and trivial, but recondite, accurate and ancient, both Greek and Latin, that I should not wish to visit Italy, except for the gratification of traveling."

The earliest foundations in our country were colleges, not universities. Scholars were often graduated early in this century at the age when now they enter. Earnest efforts are now making to establish universities. Harvard, with a boldness which is remarkable, has essentially given up its collegiate restrictions and introduced the benefits of university freedom; Yale preserves its college course intact, but has added a school of science and developed a strong graduate department; the University of Michigan and Cornell University quite early adopted the discipline of universities, and already equal or surpass not a few of their elder sisters; the University of Virginia from its foundation has upheld the university in distinction from the college idea. The cry all over the land is for

university advantages, not as superseding but as supplementing collegiate discipline.

As we, my friends, are called upon to develop a university, it becomes important not only to distinguish its essential idea from that of any other institution, but also to form a clear conception of its special province; of various plans which have governed its organization; of the good which it promotes; of the questions which are settled; of the questions which are not settled; and especially of the bearing of all these points on our land, our times, our foundation. Thus only shall we make a contribution to the intellectual agencies of this country, and add a positive gain to American learning and education in the second century of the Republic.

The tenor of my remarks has implied perhaps more diversity of opinion than really exists in respect to universities. The truth is, most institutions are not free to build anew; they can only reädjust. It has been playfully said that "traditions and conditions" impede their progress. But whatever may be the concrete difficulties, on many abstract principles there is little need of controversy. Our effort will be to accept that which is determined,—to avoid that which is obsolescent, to study that which is doubtful,—"slowly making haste."

Twelve Points Determined.

Is, then, anything settled in respect to university education? Much, very much. Can we draw a statement of what is agreed upon? At any rate we can try.

The schedule will include twelve points on which there seems to be a general agreement.

1. All sciences are worthy of promotion; or in other words, it is useless to dispute whether literature or science should receive most attention, or whether there is any essential difference between the old and the new education.

2. Religion has nothing to fear from science, and science need not be afraid of religion. Religion claims to interpret the word of God, and science to reveal the laws of God. The interpreters may blunder, but truths are immutable, eternal and never in conflict.

3. Remote utility is quite as worthy to be thought of as immediate advantage. Those ventures are not always most sagacious that expect a return on the morrow. It sometimes pays to send our argosies across the seas; to make investments with an eye to slow but sure returns. So is it always in the promotion of science.

4. As it is impossible for any university to encourage with equal freedom all branches of

learning, a selection must be made by enlightened governors, and that selection must depend on the requirements and deficiencies of a given people, in a given period. There is no absolute standard of preference. What is more important at one time or in one place may be less needed elsewhere and otherwise.

5. Individual students cannot pursue all branches of learning, and must be allowed to select, under the guidance of those who are appointed to counsel them. Nor can able professors be governed by routine. Teachers and pupils must be allowed great freedom in their method of work. Recitations, lectures, examinations, laboratories, libraries, field exercises, travels, are all legitimate means of culture.

6. The best scholars will almost invariably be those who make special attainments on the foundation of a broad and liberal culture.

7. The best teachers are usually those who are free, competent and willing to make original researches in the library and the laboratory.

8. The best investigators are usually those who have also the responsibilities of instruction, gaining thus the incitement of colleagues, the encouragement of pupils, the observation of the public.

9. Universities should bestow their honors with a sparing hand; their benefits most freely.

10. A university cannot be created in a day; it is a slow growth. The University of Berlin has been quoted as a proof of the contrary. That was indeed a quick success, but in an old, compact country, crowded with learned men eager to assemble at the Prussian court. It was a change of base rather than a sudden development.

11. The object of the university is to develop character—to make men. It misses its aim if it produces learned pedants, or simple artisans, or cunning sophists, or pretentious practitioners. Its purport is not so much to impart knowledge to the pupils, as to whet the appetite, exhibit methods, develop powers, strengthen judgment, and invigorate the intellectual and moral forces. It should prepare for the service of society a class of students who will be wise, thoughtful, progressive guides in whatever department of work or thought they may be engaged.

12. Universities easily fall into ruts. Almost every epoch requires a fresh start.

If these twelve points are conceded, our task is simplified, though it is still difficult. It is to apply these principles to Baltimore in 1876.

We are trying to do this with no controversy as to the relative importance of letters and science, the conflicts of religion and science, or the relation of abstractions and utilities; our simple aim is to make scholars, strong, bright, useful and true.

This brings me to the question which has brought you here.

THE JOHNS HOPKINS UNIVERSITY: *what will be its scope?* The Trustees have decided to begin with those things which are fundamental and move gradually forward to those which are accessory.

They will institute at first those chairs of language, mathematics, ethics, history and science which are commonly grouped under the name of the Department of Philosophy.

The Medical Faculty will not long be delayed; that of Jurisprudence will come in time; that of Theology is not now proposed.

I have lately met with an ancient saying in respect to the development of a youth. "At five," the precept read, "he was to study the Scriptures; at ten, the Mishna; at thirteen, the Talmud; at eighteen, to marry; at twenty, to attain riches; at thirty, strength; at forty, prudence, and so on to the end." So we begin with the essential, proceed to the important, expect enlarged endowments, and look for strength, prudence and the other virtues as we grow in years.

In organizing a faculty, the first chairs to be filled are those which everywhere, always and by all people in the modern Republic of Letters, are regarded as needful. We must provide for the study of languages, ancient and modern; mathematics, pure and applied; science, natural and

physical. All this is assumed as granted. But if we should do all this well and do nothing more, we should not add much to the intellectual resources of the country. We must ask ourselves other questions: What special departments of learning are now neglected in the higher institutions of this country? What can we provide for? In what order shall we proceed?

These problems require profound consideration; their answer must depend on manifold conditions; their solution will doubtless be the result of many counsels. Partly to elicit the suggestions of other teachers, and partly to exhibit what seem to me the inevitable demands of this place, I shall suggest some of the departments of higher education which seem to require attention from us. I cannot now tell all I think and hope.

As a fundamental proposition, bear in mind that we shall aim to choose the fittest teachers, and shall then expect them to do their very best work. None but a college officer will appreciate all that this brief sentence carries with it.

The Medical Sciences and Biology.

When we turn to the existing provisions for medical instruction in this land and compare them with those of European universities; when we see what inadequate endowments have been provided

for our medical schools, and to what abuses the system of fees for tuition has led; when we see that in some of our very best colleges the degree of Doctor of Medicine can be won in half the time required to win the degree of Bachelor of Arts; when we see a disposition to treat diplomas as blank paper by the civilians at home and the profession abroad; when we read the reports of the medical faculty in their own professional journals; when we see the difficulties which have been encountered at Harvard, Yale, and elsewhere, in late attempts to reörganize the medical schools; when we see the prevalence of quackery vaunting its diplomas, it is clear that something should be done. Then, turning to the other side of the picture, when we see what admirable teachers have given instruction among us in medicine and surgery; what noble hospitals have been created; what marvellous discoveries in surgery have been made by our countrymen; what ingenious instruments they have contrived; what humane and skillful appliances they have provided on the battlefield; what admirable measures are in progress for the advancement of hygiene and the promotion of public health; when we see what success has attended recent efforts to reform the system of medical instruction; when we observe all this, we need not fear that the day is distant—we may rather rejoice that the morning has dawned which

will see endownents for medical science as munificent as those now provided for any branch of learning, and schools as good as those which are now provided in any other land.

It will doubtless be long, after the opening of the University, before the opening of the Hospital, and this interval may be spent in forming plans for the department of Medicine.

But in the meantime we have an excellent opportunity to provide instruction antecedent to the professional study of medicine. At the present moment medical students avoid the ordinary colleges. A glance at the catalogues is enough to show that the usual classical or academic course is unattractive to such scholars. The reasons need not be given here. But who can doubt that a course may be maintained, like that already begun in the Sheffield School at New Haven, which shall train the eye, the hand and the brain, for the later study of medicine? Such a course should include abundant practice in the laboratories of chemistry, zoology and physics; the study of the anatomy, physiology, and pathology of the lower forms of life; an investigation of the elements of physics and mechanics, and of climatic and meteorlogical laws; the geographical distribution of disease; the remedial agencies of nature and art; and, besides these scientific studies, the student should acquire enough of French and German to follow with ease

European science, and enough of Latin for his professional needs. In other words, in our scheme of a university, great prominence should be given to the studies which bear upon Life,—the group now called Biological Sciences.

Such facilities as are now afforded under Huxley in London, and Rolleston at Oxford, and Foster at Cambridge, and in the best German universities, should here be introduced. They would serve us in the training of naturalists, but they would serve us still more in the training of physicians. By the time we are ready to open a school of medicine, we might hope to have a superior, if not a numerous, body of aspirants for one of the noblest callings to which the heart and head can be devoted.

When the medical department is organized, it should be independent of the income derived from student fees, so that there may not be the slightest temptation to bestow the diploma on an unworthy candidate; or rather let me say, so that the Johns Hopkins diploma will not be a greenback, but will be worth its face in the currency of the world.

The Modern Humanities.

Next to the study of Man, in his relations to Nature, comes the study of Man in his relations to Society. By this I mean his history, as exemplified

in the monuments of literature and art, in language, laws and institutions, in manners, morals and religion. More particularly still I refer to the principles of good government, including jurisprudence on the one hand, and political economy on the other. Legislation, taxation, finance, crime, pauperism, municipal government, morality in public and private affairs, are among the special topics. The civil law, international law, the early history of institutions, in short, the history of civilization and the requirements of a modern State come under this department. If we may judge from what is said by some of the best publicists, the United States, at this moment, is suffering from the neglect of these studies. There is a call for men who have been trained by other agencies than the caucus for the discussion of public affairs; men who know what the experience of the world has been in the development of institutions, and are prepared by intellectual and moral discipline to advance the public interests, irrespective of party, indifferent to the attainment of official stations. To this end our plans converge.

National Surveys.

It is generally conceded by our most influential men of science and of affairs, that before

many years have passed, an accurate survey of the area of the United States, corresponding with the ordnance and geographical surveys of Great Britain, France, Switzerland and Germany, must be undertaken. Under what auspices and upon what plan remains to be determined. At present the heads of all the governmental surveys acknowledge the difficulty of finding men enough, qualified enough, to carry forward efficiently such work in all its manifold departments, astronomical, geodetical, topographical, meteorological, geological, zoological, botanical, economical. If our University can provide instructions in these departments of physical research, looking forward to the future development, not only of Maryland and the Atlantic seaboard, but also of the entire land, it will do a good service.

Applied Mathematics.

There is a department of engineering which may also receive special attention here. The needs of cities or large towns are such in our day that every centre of population, where fifteen or twenty thousand persons are assembled, should have the services of a competent scientific engineer. He must of course have a general mathematical training; but he should also know how to use these fundamental principles in municipal affairs, in the

preparation of exact maps, in the determination of the supplies of water, and the methods of drainage, in the construction of roads, boulevards, pleasure grounds and parks, the building of wharves and docks, the supervision of gas works and fire engines, the erection of public buildings, monuments and places of assembly. There should be a recognized preparation for this work of civic or municipal engineering—in distinction from civil engineering, which is a more vague and general term, including perhaps the subordinate branches to which I have referred.

Architecture is closely connected with this department. So far as I am aware there are now, in this new country where so much building is in progress, but two schools for the professional study of this, the first of arts.

I can hardly doubt that such arrangements as we are maturing will cause this institution to be a place for the training of professors and teachers for the highest academic posts; and I hope in time to see arrangement made for the unfolding of the philosophy, principles and methods of education in a way which will be of service to those who mean to devote their lives to the highest departments of instruction.

But in forming all these plans we must beware lest we are led away from our foundations; lest we make our schools technical instead of liberal; and

impart a knowledge of methods rather than of principles. If we make this mistake, we may have an excellent Polytechnicum but not a University.

The Faculty and Students.

Who shall our teachers be?

This question the public has answered for us; for I believe there is scarcely a preëminent man of science or letters, at home or abroad, who has not received a popular nomination for the vacant professorships. Some of these candidates we shall certainly secure, and their names will be one by one made known. But I must tell you, in domestic confidence, that it is not an easy task to transplant a tree which is deeply rooted. It is especially hard to do so in our soil and climate. Though a migratory people, our college professors are fixtures. Such local college attachments are not known in Germany; and the promotions which are frequent in Germany are less thought of here. When we think of calling foreign teachers, we encounter other difficulties. Many are reluctant to cross the sea; and others are, by reason of their lack of acquaintance with our language and ways, unavailable. Besides we may as well admit that London, Paris, Leipsic, Berlin and Vienna, afford facilities for literary and scientific growth

and influence, far beyond what our country affords. Hence, it is probable that among our own countrymen, our faculty will be chiefly found.

I wrote, not long ago, to an eminent physicist, presenting this problem in social mechanics, for which I asked his solution. "We cannot have a great university without great professors; we cannot have great professors till we have a great university: help us from the dilemma." Let me tell his answer: "Your difficulty," he says, "applies only to old men who are great; these you can rarely move; but the young men of genius, talent, learning and promise, you can draw. They should be your strength."

The young Americans of talent and promise—there is our strength, and a noble company they are! We do not ask from what college, or what state, or what church they come; but what do they know, and what can they do, and what do they want to find out.

In the biographies of eminent scholars, it is curious to observe how many indicated in youth preëminent ability. Isaac Casaubon, whose name in the sixteenth century shed lustre on the learned circles of Geneva, Montpellier, Paris, London and Oxford, began as professor of Greek, at the age of twenty-two; and Heinsius, his Leyden cotemporary, at eighteen. It was at the age of twenty-eight, that Linnæus first published his *Systema Naturæ.*

Cuvier was appointed a professor in Paris at twenty-six, and, a few months later, a member of the Institute. James Kent, the great commentator on American law, began his lectures in Columbia College at the age of thirty-one. Henry was not far from thirty years of age when he made his world-renowned researches in electro-magnetism; and Dana's great work on mineralogy was first published before he was twenty-five years old, and about four years after he graduated at New Haven. Look at the Harvard lists:—Everett was appointed Professor of Greek at twenty-one; Benjamin Peirce of Mathematics at twenty-four; and Agassiz was not yet forty when he came to this country. For fifty years Yale College rested on three men selected in their youth by Dr. Dwight, and almost simultaneously set at work; Day was twenty-eight, Silliman, twenty-three, and Kingsley, twenty-seven, when they began their professorial lives. The University of Virginia, early in its history, attracted foreign teachers, who were all young men.

We shall hope to secure a strong staff of young men, appointing them because they have twenty years before them; selecting them on evidence of their ability; increasing constantly their emoluments, and promoting them because of their merit to successive posts, as scholars, fellows, assistants, adjuncts, professors and university professors. This plan will give us an opportunity to introduce some

of the features of the English fellowship and the German system of privat-docents; or in other words, to furnish positions where young men desirous of a university career may have a chance to begin, sure at least of a support while waiting for promotion.

Our plans begin but do not end here. As men of distinction, who have won the highest rank in their callings, are known to be free, we shall invite them to come among us.

For a time, at least, we shall also look to the faculties of other colleges for occasional help. Many years ago, among the plans for establishing a university, in distinction from a college, at Cambridge, Professor Peirce proposed that various colleges should send up for a portion of the year, and for a term of years, their best professors, who should receive a generous acknowledgment for this service, and good opportunities for work, but should not renounce their college homes. Without having heard of his plan, which I think had not been made public, the Trustees of the Johns Hopkins University have worked out a kindred scheme. They propose to ask distinguished professors from other colleges to come to us during a term of years, each to reside here for an appointed time, and be accessible, *publice et privatim*, both in the lecture room and the study.

Where do we look for students?

At first, at home, in Baltimore and Maryland; then, in the States adjacent; then, in the regions of our country where, by the desolations of war, educational foundations have been impaired; and presently, according to the renown of the faculty, which we are able to bring here, and the completeness of the establishment, we hope that our influence will be national.

Of what grade will they be? Mature enough to be profited by university education. The exact standard is not yet fixed. It must depend on the colleges and schools around us; there must be no gap in the system, and we must keep ahead, but the discussions now in progress, respecting the City College, Agricultural College and St. John's College, must delay our announcements. Our standard will doubtless be as high as the community requires.

What will the buildings be?

At first, temporary, but commodious; in the heart of the city, accessible to all; and fitted for lectures, laboratories, library and collections. At length, permanent, on the site at Clifton; not a mediæval pile, I hope, but a series of modern institutions; not a monumental, but a serviceable group of structures. The middle ages have not built any cloisters for us; why should we build for the middle ages? In these days laboratories are

demanded on a scale and in a variety hitherto unknown, for chemistry, physics, geology and mineralogy, comparative anatomy, physiology, pathology. Oxford with its New Museum; Cambridge with its Cavendish laboratory; Owens College with its excellent work-rooms; South Kensington with the new apartments of Huxley and Frankland; Leipsic, Vienna, Berlin, all afford illustrations of the kind of structures we shall need. Already measures have been initiated for the improvement of Clifton as a university site. Although it will take time to develop the plans, I hope that we shall all live to see the day when the simplicity, the timeliness, and the strength which characterized our founder's gift, will be also apparent in the structures which his trustees erect; and when that site, beautiful in itself and already well planted, may be, in fact, an academic grove, with temples of learning, so appropriate, so true, and so well built that no other ornament will be essential for beauty, and yet that in their neighborhood no work of art will be out of place.

Our affiliations deserve mention. Already harmonious relations have been established between this University and the Peabody Institute, the Academy of Sciences, and the City College, and the departments of State and City Education. I may also add that the authorities of the scientific institutions in Washington have evinced in many ways good

will toward their new ally in Baltimore. As this University grows, we may anticipate perpetual advantages from its proximity to the national capital, where the Smithsonian Institution, the Engineer Corps, the Naval Observatory, the Coast Survey, the Signal Service, the Botanical Gardens, the Congressional Library, the National Museum, the Territorial Surveys, the Army Medical and Surgical Collections, and the Corcoran Art Gallery are such powerful instruments for the advancement of science, literature and art.

The relation of this University to the *higher education of women* has not been as yet discussed by the Trustees, and doubtless their future conclusions will depend very much upon the way in which the subject is brought forward. I am not at liberty to speak for them, but personally have no hesitation in saying that the plans pursued in the University of Cambridge (England), especially in the encouragement of GIRTON College, seem likely to afford a good solution of a problem which is not without difficulty, however it is approached. Of this I am certain, that they are not among the wise, who depreciate the intellectual capacity of women, and they are not among the prudent, who would deny to women the best opportunities for education and culture.

I trust the day is near when some one, following the succession of Peabody and Hopkins, will insti-

tute here a "Girton College," which may avail itself of the advantages of the Peabody and Hopkins foundations, without obliging the pupils to give up the advantages of a home, or exposing them to the rougher influences which I am sorry to confess are still to be found in colleges and universities where young men resort. For the establishment in Baltimore of such a hall as Girton I shall confidently look.

The University Freedom.

If we would maintain a university, great freedom must be allowed both to teachers and scholars. This involves freedom of methods to be employed by the instructors on the one hand, and on the other, freedom of courses to be selected by the students.

But this freedom is based on laws,—two of which cannot be too distinctly or too often enunciated. A law which should govern the admission of pupils is this, that before they win this privilege they must have been matured by the long, preparatory discipline of superior teachers, and by the systematic, laborious, and persistent pursuit of fundamental knowledge; and a second law, which should govern the work of professors, is this, that with unselfish devotion to the discovery and advance-

ment of truth and righteousness, they renounce all other preferment, so that, like the greatest of all teachers, they may promote the good of mankind.

I see no advantage in our attempting to maintain the traditional four-year class-system of the American colleges. It has never existed in the University of Virginia; it is modified, though not nominally given up at Harvard; it is not an important characteristic of Michigan and Cornell; it is not known in the English, French or German universities. It is a collegiate rather than a university method. If parents or students desire us to mark out prescribed courses, either classical or scientific, lasting four years, it will be easy to do so. But I apprehend that many students will come to us excellent in some branches of a liberal education and deficient in others—good perhaps in Greek, Latin and mathematics; deficient in chemistry, physics, zoology, history, political economy, and other progressive sciences. I would give to such candidates on examination, credit for their attainments, and assign them in each study the place for which they are fitted. A proficient in Plato may be a tyro in Euclid. Moreover, I would make attainments rather than time the condition of promotion; and I would encourage every scholar to go forward rapidly or go forward slowly, according to the fleetness of his foot and his freedom from

impediment. In other words, I would have our University seek the good of individuals rather than of classes.

The sphere of a university is sometimes restricted by its walls, or is limited to those who are enrolled on its lists. There are three particulars in which we shall aim at extra-mural influence: first, as an examining body, ready to examine and confer degrees or other academic honors on those who are trained elsewhere; next, as a teaching body, by opening to educated persons (whether enrolled as students or not) such lectures as they may wish to attend, under certain restrictions—on the plan of the lectures in the high seminaries of Paris; and, finally, as in some degree at least a publishing body, by encouraging professors and lecturers to give to the world in print the results of their researches.

Conclusion.

Let us now, as we draw near the close of this allotted hour, turn from details and recur to general principles.

What are we aiming at?

An enduring foundation; a slow development; first local, then regional, then national influence;

the most liberal promotion of all useful knowledge; the special provision of such departments as are elsewhere neglected in the country; a generous affiliation with all other institutions, avoiding interferences, and engaging in no rivalry; the encouragement of research; the promotion of young men; and the advancement of individual scholars, who by their excellence will advance the sciences they pursue, and the society where they dwell.

No words could indicate our aim more fitly than those by which John Henry Newman expresses his "Idea of the University," in a page burning with enthusiasm, to which I delight to revert.

What will be our agencies?

A large staff of teachers; abundance of instruments, apparatus, diagrams, books, and other means of research and instruction; good laboratories, with all the requisite facilities; accessory influences, coming both from Baltimore and Washington; funds so unrestricted, charter so free, schemes so elastic, that as the world goes forward, our plans will be adjusted to its new requirements.

What will be our methods?

Liberal advanced instruction for those who want it; distinctive honors for those who win them; appointed courses for those who need them; special courses for those who can take no other; a combi-

nation of lectures, recitations, laboratory practice, field work and private instruction; the largest discretion allowed to the Faculty consistent with the purposes in view; and, finally, an appeal to the community to increase our means, to strengthen our hands, to supplement our deficiencies, and especially to surround our scholars with those social, domestic and religious influences which a corporation can at best imperfectly provide, but which may be abundantly enjoyed in the homes, the churches and the private associations of an enlightened Christian city.

CITIZENS OF BALTIMORE AND MARYLAND:— This great undertaking does not rest upon the Trustees alone; the whole community has a share in it. However strong our purposes, they will be modified, inevitably, by the opinions of enlightened men; so let parents and teachers incite the youth of this commonwealth to high aspirations; let wise and judicious counsellors continue their helpful suggestions, sure of being heard with grateful consideration; let skillful writers, avoiding captiousness on the one hand and compliment on the other, uphold or refute or amend the tenets here announced; let the guardians of the press diffuse widely a knowledge of the benefits which are here provided; let men of means largely increase the usefulness of this work by their timely gifts.

At the moment there is nothing which seems to me so important, in this region, and indeed in the entire land, as the promotion of good secondary schools, preparatory to the universities. There are old foundations in Maryland which require to be made strong, and there is room for newer enterprises, of various forms. Every large town should have an efficient academy or high school; and men of wealth can do no greater service to the public than by liberally encouraging, in their various places of abode, the advanced instruction of the young. None can estimate too highly the good which came to England from the endowment of Lawrence Sheriff at Rugby, and of Queen Elizabeth's school at Westminster, or the value to New England of the Phillips foundations in Exeter and Andover.

Every contribution made by others to this new University will enable the Trustees to administer with greater liberality their present funds. Special foundations may be affiliated with our trust, for the encouragement of particular branches of knowledge, for the reward of merit, for the construction of buildings; and each gift, like the new recruits of an army, will be the more efficient because of the place it takes in an organized and efficient company. It is a great satisfaction in this world of changes and pecuniary loss to remember what safe investments have been made at Harvard and Yale,

and other old colleges, where dollar for dollar is still shown for every gift.

The atmosphere of Maryland seems favorable to such deeds of piety, hospitality and "good-will to men." George Calvert, the first Lord Baltimore, comes here, returns to England and draws up a charter which becomes memorable in the annals of civil and religious liberty, for which, "he deserves to be ranked," (as Bancroft says), "among the most wise and benevolent lawgivers of all ages;" among the liberals of 1776 none was bolder than Charles Carroll of Carrollton; John Eager Howard, the hero of Cowpens, is almost equally worthy of gratitude for the liberality of his public gifts; John McDonogh, of Baltimore birth, bestows his fortune upon two cities for the instruction of their youth; George Peabody, resident here in early life, comes back in old age to endow an Athenæum, and begins that outpouring of munificence which gives him a noble rank among modern philanthropists; Moses Sheppard bequeaths more than half a million for the relief of mental disease; Rinehart, the teamster boy, attains distinction as a sculptor, and bestows his well-won acquisitions for the encouragement of art in the city of his residence; and a Baltimorean still living, provides for the foundation of an astronomical observatory in Yale College; while Johns Hopkins lays a foun-

dation for learning and charity, which we celebrate to-day.

Let me enlist attention from THE YOUTH OF BALTIMORE. For you, my young friends, these great advantages are provided. What will be your response? Is there not among you some bookbinder's boy, like Michael Faraday, who will be led by our Royal Institution to a line of research for which the world will be better; is there not here some private teacher, like Cuvier, or some minister's son, like Agassiz, burning with a desire to pursue the study of natural history; is there not some sophomore in college, like Alexander Hamilton, ready to discuss the questions of public finance, eager to be trained by a master economist; is there not in Baltimore a genius in mathematics, like Gauss, who at three years old corrected his father's arithmetic, at eighteen entered the University of Göttingen where he made a discovery which had puzzled geometers "from the days of Euclid," and who died at seventy-seven, among the most eminent of his time? If so, I say it is for you, bright youths, that these doors are opened. Enter the armory and equip yourselves.

GENTLEMEN OF THE BOARD OF TRUSTEES:—The duty you assigned me of unfolding your plans is now imperfectly discharged. I hope that I have

not struck too low a key in speaking of the opportunities, and on the contrary, that I have not said anything in rivalry or boast. If I have seemed cautious, you are sanguine, invigorated by the force of a lofty purpose, and the comforting consciousness of ample means. If I have seemed sanguine, you are cautious, aware that there are other institutions, older, richer, and more experienced than this, whose example we must study, and whose help we must seek.

Before concluding, I repeat in public the assent which I have privately made to your official overtures. In speaking of your freedom from sectarian and political control, you expressed to me a hope that this foundation should be pervaded by the spirit of an enlightened Christianity; while you proposed to train young men for the service of the State and the responsibilities of public life, you hoped the University would never engage in sectional, partisan and provincial animosities. In both these propositions I now as then express my cordial and entire concurrence.

Our work now begins. This place is felicitous, midway between the extremes of North and South, and redolent of memories of men and women whose names the world will never forget. This day is suggestive, reminding us of one whose wise

moderation wrought great achievements. This year is auspicious, inviting us to sink political animosities in sentiments of fraternal good will, and of patriotic regard for a re-united republic. This company is inspiring; the city, the state, and the older seats of learning, far and near, here express their good will. Most welcome among their utterances are the words with which the oldest college in the land extends its fellowship to the youngest of the band.

So, friends and colleagues, we launch our bark upon the Patapsco, and send it forth to unknown seas. May its course be guided by looking to the heavens and the voyage promote the glory of God and the good of Mankind.

Permit one word of a personal character before I take my seat. My life thus far has been spent in two universities, one full of honors, the other of hopes; one led by experience, the other by expectations. May the lessons of both, the old and the new, be wisely blended here. There is not a place in all the land which I should be so glad to fill as that in which I have been placed by your favorable consideration; but the burdens will be heavy unless your kind indulgence is continued. Standing almost within sight of the monument which has given a name to this city, do not deem it presumptous if I adopt the words which Washington

addressed to the citizens of Baltimore in 1789, and say on his memorial day, as he said then:

"I know the delicate nature of the duties incident to the part I am called to perform, and I feel my incompetence without the singular assistance of Providence to discharge them in a satisfactory manner; but having undertaken the task from a sense of duty, no fear of encountering difficulties, and no dread of losing popularity shall ever deter me from pursuing what I take to be the true interests of my country."

Johns Hopkins University.

FIRST ANNUAL REPORT.

BALTIMORE, MD.

1876.

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OF THE

Johns Hopkins University,

BALTIMORE, MD.

1876.

BALTIMORE:
PRINTED BY WILLIAM K. BOYLE & SON,
Corner Baltimore and St Paul Streets.
1876.

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JUDGE GEORGE W. DOBBIN,
FRANCIS T. KING,
THOMAS M. SMITH,
LEWIS N. HOPKINS,
GALLOWAY CHESTON, *ex officio.*

COMMITTEE IN CHARGE OF THE CLIFTON GROUNDS:

REVERDY JOHNSON, JR.
FRANCIS WHITE,
GALLOWAY CHESTON, *ex officio.*

STATEMENT OF THE TRUSTEES.

THE annual meeting of the Trustees of The Johns Hopkins University was held in Baltimore, January 3, 1876, and the officers of the previous year were re-elected.

A statement in respect to the progress which has been made in the organization of the Institution was read to the Board by the President of the University, and ordered to be printed.

The Trustees add to it the following announcement in respect to their choice of a President of the University:

Early in the month of February, 1874, the Trustees of the University having been apprised by the Executors of Johns Hopkins, of the endowment provided by his will, took proper steps for organization and entering upon the practical duties of the trust, and addressed themselves to the selection of a President of the University. With this view the Trustees sought the counsel and advice of the heads of several of the leading seats of learning in the country, and, upon unanimous recommendation and endorsement from these sources, the choice fell upon

Mr. Daniel C. Gilman, who, at the time, occupied the position of President of the University of California.

Mr. Gilman is a graduate of Yale College, and for several years before his call to California, was a Professor in that institution, taking an active part in the organization and development of "The Sheffield Scientific School of Yale College," at New Haven.

Upon receiving an invitation to Baltimore, he resigned the office which he had held in California since 1872, and entered upon the service of The Johns Hopkins University, May 1, 1875.

The Trustees have invited him to deliver an Inaugural Address on the 22d of February, 1876, at which time an explanation of the plans of the University may be expected.

GALLOWAY CHESTON,
President of the Trustees.

25 North Charles St.
Baltimore, January 4, 1876.

REPORT OF THE PRESIDENT.

To the Trustees of

The Johns Hopkins University:

As the time of your Annual Meeting is at hand, it has occurred to me that it may be serviceable for you to review in a summary way the principal transactions to which you have been officially committed. I have therefore brought together the following statements, hoping that year by year, as long as the University shall exist, the example will be followed, for thus it will be easy for all who are interested in the administration of this trust to discover the principles upon which it is conducted, and to estimate the results which may come from this munificent foundation. I hope that you will deem it wise to communicate these Reports annually to the public,—for although this is a private corporation, it is

founded for public purposes,—and there is no surer safeguard for the wise administration of its affairs in all the years to come than a knowlege that it will be scrutinized by enlightened men, not only in Baltimore and the neighborhood, but wherever there is an interest in the progress of American education. It is obvious that during your deliberations, there will be constant need of reticence; the appointment of professors, the construction of buildings, and the interior management of the University are among the subjects on which it is not possible to make any public announcements before the authorities have reached their conclusions. But when the plans are formed, the public are interested in hearing of them, and in knowing the reasons which have led to their adoption. The University cannot thrive unless it has the confidence of enlightened men, and this confidence can most readily be secured by that publicity which fully and regularly makes known the conclusions of the Trustees. In this respect the oldest of American Colleges gives an example to all her younger sisters. The reports of Harvard College are models of concise and intelligible

official documents, and have doubtless helped to secure for that institution the confidence both of benefactors and teachers. It would be advantageous to the country if similar documents were published by every institution which bears the name of a college or university.

The Munificence of Johns Hopkins.

On the 24th of August, 1867, at the request of Johns Hopkins, a merchant of Baltimore, twelve of his friends and acquaintances, likewise residents of Baltimore, formed an Incorporation in accordance with the General Laws of the State of Maryland, under the name of The Johns Hopkins University. The signatures attached to the certificate of Incorporation were these: Thomas M. Smith, William Hopkins, Lewis N. Hopkins, John W. Garrett, Alan P. Smith, John Fonerden, Geo. W. Dobbin, Geo. M. Gill, Andrew Sterett Ridgely, Thomas Donaldson, James A. L. McClure, and Charles J. M. Gwinn.

The Trustees who were named in the certificate as managers of the University were

these: Galloway Cheston, Francis T. King, Lewis N. Hopkins, Thos. M. Smith, William Hopkins, John W. Garrett, George W. Dobbin, George Wm. Brown, John Fonerden, Charles J. M. Gwinn, Reverdy Johnson, Jr. and Francis White.

The Trustees first met on the 13th of June, 1870, when a vacancy in the Board which had been occasioned by the death of Dr. John Fonerden, was filled by the election of Dr. James Carey Thomas. A President of the Board, Mr. Galloway Cheston, and a Secretary, Mr. William Hopkins, were then chosen. The Trustees did not meet again till after the death of Mr. Hopkins, which occurred on the 24th of December, 1873.

It then appeared that a munificent endowment for the proposed University had been left by the will of Mr. Hopkins to these Trustees. It included his late residence at Clifton, on the edge of the City of Baltimore, (an estate of 330 acres of land,) fifteen thousand shares of the Baltimore and Ohio Rail Road Stock, having a par value of $1,500,000; and other securities having an estimated value of

$750,000. The value of the entire endowment was estimated to be more than $3,000,000.

The same benefactor had given a sum of nearly the same amount for the foundation of a Hospital, and had expressed the wish that these two Institutions should co-operate for the promotion of Medical Science and Education.

His gift to the University is one of the largest single gifts ever bestowed upon an institution of learning; and is made *without conditions*, (except that the capital cannot be used for building,) so that its income as the years roll on, will be applied as the Trustees may decide for the promotion of knowledge and the advanced instruction of youth.

This bounty, so large and so wise, has attracted the admiration of enlightened men in every part of this land, and in other lands, and will doubtless secure for the giver a lasting name among the benefactors of mankind.

On the 6th of February, 1874, the Trustees entered on their administration of the trust confided to them, and on the 18th of March, 1875, they received from the executors of Mr. Hopkins, the principal part of the University bequest. From that time on, their meetings

have been frequent, and their deliberations have been directed to the right mode of employing the funds entrusted to them so as to secure the highest intellectual and moral results in the present and in future generations. It is thus apparent that although more than eight years have passed since Mr. Hopkins's purposes were in part made known to them, it is less than one year since they have been in a position to go forward efficiently.

Preliminary Enquiries.

It is a difficult task to organize an institution of learning on such a basis that its influence may be felt for good far beyond our own State, and far beyond our own times. The Trustees of The Johns Hopkins University have been governed by a deep sense of this responsibility. They have considered themselves bound by the munificence of the Founder's gift, and by its freedom from conditions, to observe with care the present condition of literature and science, to study the requirements of our land at its present epoch, and to discover, so far as may be possible, the ex-

perience of the most enlightened teachers and the most efficient universities in this and other lands. It is thus, and thus only, that they have hoped to escape from the dangers which are always encountered in laying the foundations of a large and enduring structure. They have also been confident that a great institution of learning, cannot, (at least in this country,) be constructed in a day or year. It must be a growth,—a natural development,—and not a pre-ordained scheme.

Governed by these considerations, one of the earliest acts of the Trustees was to open a correspondence with the heads of several of the most successful Colleges and Universities of this country. They were not mistaken in the belief that such overtures would receive a cordial response from most of those to whom they were addressed. The foundation of a new University, instead of being regarded in the older Colleges as the initiation of a rival undertaking, was recognized as a positive addition to the intellectual wealth of the country. A number of the Trustees made personal visits to some of the Colleges which are richest in traditions and material possessions, and which

now enjoy the confidence of educated men. The Presidents of three Universities communicated to the Trustees of this University, in the most unreserved manner, their opinions upon the organization and management of American Colleges and their counsels in respect to the new foundation. Many college professors and administrators of scientific and literary institutions also gave their suggestions; and thus much of the best American experience was brought into the service of this institution at its very beginning.

A President of the University was then elected with the expectation that he would become the executive officer of the Trustees in organization and administration; and that on him would devolve the responsibility of suggesting to the Trustees, gradually, as circumstances developed, specific plans and modes of procedure adapted to give efficiency to the new University. He was encouraged by the Trustees to confer with the Teachers of Maryland to study the characteristics of educational foundations, here and in the adjacent States, and also to continue the inquiries which they had made in more distant parts of the country.

After a short time, he was authorized to visit some of the principal institutions in Great Britain and on the Continent, in order that he might confer with European scholars and bring home fresh impressions of the progress of foreign Universities, as well as plans, programmes, reports and other educational documents.

Fundamental Principles.

By these various steps, the Trustees have come to a substantial agreement as to the principles which must govern their earliest proceedings. As the institution grows, new light will doubtless be received, and there will be abundant opportunities to explain and defend their initial decisions. Here it is only necessary to place on record their desire that the University now taking shape should forever be free from the influences of ecclesiasticism or partisanship, as those terms are used in narrow and controversial senses; that all departments of learning,—mathematical, scientific, literary, historical, philosophical,—should be promoted, as far as the funds at command

will permit, the new departments of research receiving full attention, while the traditional are not slighted; that the instructions should be as thorough, as advanced and as special as the intellectual condition of the country will permit; that the glory of the University should rest upon the character of the teachers and scholars here brought together, and not upon their number, nor upon the buildings constructed for their use; that its sphere of influence should be national, while at the same time all the local institutions of education and science should be quickened by its power; and finally that among the professional departments, special attention should be first given to the sciences bearing upon medicine, surgery and hygiene, for which some provision has been made by the munificent gift of our founder to establish The Johns Hopkins Hospital.

Opening of the University.

Postponing for a time the questions of professional education, the Trustees determined that the University should commence with a

Faculty of Literature and Science, and that arrangements should be made for the reception of students in the autumn of 1876.

They also decided to postpone the construction of buildings at Clifton, (the prospective site of the University,) and to provide the requisite class rooms and lecture rooms in the heart of the city. Two convenient houses on Howard Street, have therefore been purchased, and are now being fitted up for their new uses. The adjacent land acquired by this purchase is sufficient for the construction of a library and assembly room, and of a chemical laboratory, if it is thought expedient to put this there.

Development of Clifton.

The Trustees have not forgotten the importance of developing the Clifton site with reference to the purposes to which it will be devoted. In addition to the constant care of the grounds, much consideration has been given to the various requirements of the University, for public buildings, residences, botanical garden, play grounds, etc., and to the best means of

approach from different parts of the city. As it is of great importance both to the city and the University that wise foresight should govern all improvements in that neighborhood, they have requested a gentleman who has no superior in the country as an advisor in respect to public grounds, to give them his counsel and suggestions respecting the management of Clifton as a suburb of Baltimore.

Current Expenditures.

In accordance with the wishes of the Founder no portion of the capital of his gift will be used for buildings. It is therefore necessary to lay by for some years a considerable part of the income, in order that the requisite construction funds may be at command when the buildings are commenced. The Trustees have therefore restricted themselves to an outlay of sixty thousand dollars for instruction during the first year, in addition to what is expended for administration, purchase of books and apparatus, and other essential outlays. With this allowance it will not be possible to appoint a large staff of experienced teachers.

A few leaders in the main departments of study, a company of non-resident professors and lecturers, a strong body of adjunct or assistant professors, and a promising group of associates or holders of fellowships may however be secured; and each successive year, as the wants and the capacity of the University are developed, new appointments will be made.

The unappropriated income will be separately invested as a Reserved Fund for Building and other purposes.

Selection of Professors.

During the last two months, the Trustees and especially their Executive Committee, have entered upon one of the most delicate and difficult tasks which will ever come upon them. The selection of professors and teachers upon whom will devolve the instruction of youth, the chief work of the University, is peculiarly difficult because there are here no traditions for guidance, no usages in respect to the distribution of subjects, and none in respect to the kind of instruction to be given;

and also because the plans of the Trustees must depend very much upon the character of the teachers whom they bring together.

A very large number of candidates have been suggested to the Trustees; but among them all there are but a few who have attained distinction as investigators or as teachers. Most of those whose names have been thus presented are young men, usually of much promise, who have not yet had an opportunity to show their intellectual power in any department of higher instruction; and yet among this very class a discerning choice will doubtless discover those who are soon to be the men of scientific and literary renown. The Trustees propose to open freely the doors of promotion to those young men who seem to be capable of the highest work,—appointing them at first for restricted and definite periods. Moreover they hope for a while to gain much of the influence and co-operation of older and more distinguished men by inviting one and another to come here from time to time with courses of lectures. But the idea is not lost sight of that the power of the University will depend upon the character of its resident staff of permanent

professors. It is their researches in the library and the laboratory; their utterances in the class room and in private; their example as students and investigators, and as champions of the truth; their publications through the journals and the scientific treatises which will make the University in Baltimore an attraction to the best students, and serviceable to the intellectual growth of the land.

In selecting a staff of teachers, the Trustees have determined to consider especially the devotion of the candidate to some particular line of study and the certainty of his eminence in that specialty; the power to pursue independent and original investigation, and to inspire the young with enthusiasm for study and research; the willingness to co-operate in building up a new institution; and the freedom from tendencies toward ecclesiastial or sectional controversies. The Trustees will not be governed by denominational or geographical considerations in the appointment of any teacher; but will endeavor to select the best person whose services they can secure in the position to be filled,—irrespective of the place where he was born, or the college in which he was

trained, or the religious body with which he has been enrolled.

Thus far, no appointments of professors have been made by the Trustees,—though negotiations are in progress which must very soon be concluded. But the University has had in its service for several months, Mr. Henry A. Rowland, lately of the Rensselaer Polytechnic School in Troy, who has been pursuing some studies abroad in the department of Physics, and has been collecting for The Johns Hopkins University, information in respect to the manufacture and purchase of apparatus, and in respect to the construction and management of physical laboratories. The papers which Mr. Rowland has published in scientific journals abroad and at home, are the first contributions to science which have been made under the auspices of this University, and may be regarded as an indication of the work which the Trustees are ready to encourage.

Fellowships and Scholarships.

The Founder requested the Trustees to establish a number of scholarships, (freeing the

holders from tuition charges,) to be bestowed upon proper candidates from the States of Maryland, Virginia and North Carolina. Arrangements have been made for the bestowal of twenty such scholarships at the opening of the University, and probably an equal number will be annually bestowed.

Five additional scholarships, open to students from any part of the country, will be also awarded to those who appear best in an open competition.

Ten fellowships, yielding each $500 a year, will be opened to advanced students, who may be capable of rendering assistance in the various branches of learning.

A scholarship, tenable for two years, has been temporarily provided, to be bestowed by competition on a deserving student from the Baltimore City College.

Books and Scientific Collections.

The Trustees have made an appropriation of thirty thousand dollars for the purchase of books, diagrams, apparatus and scientific collections. It is not proposed to attempt at

once the formation of a large library, for the Peabody Library of Baltimore, (numbering 60,000 recently purchased volumes,) has been built up as a reference library for scholars, and so long as the University remains in the City of Baltimore, professors and students will have easy access to this collection. It is proposed however, to buy at once such books as are needed every day in the University, and to keep a portion of them in one convenient reading room, as a Ready-Reference Library, and to distribute other portions among the class rooms and lecture rooms. The purchase of scientific apparatus and collections will be chiefly deferred until the counsel of professors in various departments of science can be secured. As the University develops, great advantages will come to it from its proximity to Washington, where the National Library, the National Collections in Natural History, the Army Medical Museum, etc. are of great and increasing value, and where many other National scientific institutions are also directed by scholars of renown.

A small sum of money was expended last summer under the direction of Dr. P. R. Uhler,

in collecting specimens of the fauna of Maryland.

CONCLUSION.

It is the special desire of the Trustees to cultivate the most harmonious relations with all other institutions of learning in Baltimore and elsewhere. They recognize that their institution must rest on a good system of secondary and primary schools, and they will therefore lend their influence in every legitimate way for the encouragement of public and private seminaries, which may fit scholars for the University. They are also well aware that the bounty of Mr. Hopkins, munificent as it is, will not be adequate to provide all that a cultivated community may desire to possess for the promotion of science, literature and art. It will therefore be their aim to encourage the growth of other institutions, and to seek an affiliation with them so that the Hopkins Fund, untrammelled as it is, may be directed to those objects of general importance which are not otherwise provided for in this community.

DANIEL C. GILMAN,
President of the Johns Hopkins University.

BALTIMORE, *January* 1, 1876.

APPENDIX.

COLLECTIONS IN GEOLOGY AND NATURAL HISTORY.

Doubtless the Johns Hopkins University when it is organized will be an important agency in the study of the natural characteristics of the State of Maryland. The Geology, Mineralogy and Natural History, as well as the Topography and Meteorology will be studied by the Professors and students here assembled. As a slight indication of their wishes in this respect, the Trustees last summer enlisted the assistance of Mr. P. R. Uhler, President of the Maryland Academy of Sciences, and from him they have received the following statement.

BALTIMORE, *January* 15, 1876.

With regard to the results of the appropriation of $400 by the Johns Hopkins University, placed in my charge to secure specimens of natural history, I beg leave, respectfully, to submit the following report.

My chief aim in directing Mr Ralph Baumhauer, the collector, was towards securing a typical series of the objects illustrative of the past and present life of a part of the State of Maryland.

Aware that the time of four months would admit of the examination of only a small area of surface, the collector was instructed to make Glymont in Charles County, a base from which to proceed up, down, and across the Peninsula. He was to pack and store the specimens there for future shipment.

Reaching the place on June 1st, he at once examined the adjacent country, and commenced to dig fossils from the Eocene

and Miocene Marl-beds of Mattawoman Creek and vicinity. The marl was hard and refractory, and rendered the acquisition of specimens slower than at some other places. By the end of that month he had visited all the larger deposits of marl, from Fort Washington on the North to Indian head on the South, and had amassed about one and a half barrels of fossils. Living objects had also been sought; and of these, two dozens tortoises, terrapins, and turtles of six species; two kinds of newts; three kinds of lizards; five kinds of snakes; embryo birds; bird's eggs; turtle eggs; the nests of mud wasps, and a few kinds of fish and mollusks were added to the stock.

The collection of fossils was valuable, and the series of tortoises precious, as showing this region to be one of those centres of varying physical influences which determine variability in the creatures subject to them. Three or four principal types of configuration and ornament are there differentiated, which include intervening links that serve to unite forever in one, several forms previously considered to be species.

Similar variability was also found to prevail in the snakes, fresh water mussels and frogs; and a most interesting addition to our knowledge was made in the case of the beautiful Southern tree-frog, *Hyla viridis*. This creature had not previously been recorded as an inhabitant of our Western peninsula, and when first taken, in the month of July, (which proved to be its time for spawning,) its bright green sides were decorated with a golden yellow stripe, which became obliterated after the love-season was past.

From this place he went farther South, collecting near Pope's Creek, Allen's Fresh and Port Tobacco; and finding Miocene fossils present in all the marl-beds.

The remainder of his time was spent in Saint Mary's county, where he amassed long series of Post-Pleiocene fossils, and considerable collections of fish, crustacea, reptiles and mollusks.

There the country was lower and more level, with physical conditions of greater uniformity, and where the forms of life

were less variable than those he had left. The fossils were more numerous in individuals, and somewhat so in genera and species. Of them, the spiral shells belonged to more recent forms, and were of more highly specialized types. The fresh water terra. pins were replaced by the salt-marsh species, and the frogs, fish, mollusks and crustacea were of other kinds.

He also made a side trip across the peninsula to the Patuxent river, and brought from there the large fossil Pectens, the Perna, and other forms belonging to the Miocene beds of that section.

The general results of the expedition are embodied in a moderately representative collection of the Eocene, Miocene and Pleiocene fossil mollusca, including numerous duplicates; in a remarkable series of the Chelonian reptiles; in a fine series of the tailless and tailed Batrachia; and in conspicuous genera of the fish, snakes, lizards, crustacea and mollusks of the Western peninsula of Maryland on its continental side.

These collections, with the exception of two barrels of fossils stored in the warehouse at Glymont, have been all received in good condition and placed in the larger building of the University, on Howard St.

In conclusion, permit me, respectfully, to suggest that a full series of specimens of each group of these tortoises, turtles, frogs, newts, crustacea and fossils be preserved in glass jars and boxes for future reference of the professors and students of the University, so that, in all time to come, these humbler of Nature's monuments may contribute to the history of the life of the past and present, as it stands connected with the structure of our State and its Faunal districts.

A statement of the items of expenditure of the money has already, with the vouchers, been handed to your clerk.

Respectfully submitted,

P. R. UHLER.

PRELIMINARY ANNOUNCEMENT.

The Johns Hopkins University, Baltimore, Md., will receive Students on Tuesday, the third of October, 1876.

Previous to that time, and as soon as the appointments are made, the names of the Professors and Instructors in Scientific and Literary departments, will be publicly made known. The Faculties of Medicine and Law will not be organized at present, nor will all the proposed chairs in the Faculty of Philosophy be filled at first. There will be professors and assistant professors in Greek, Latin, German, French and English; in Mathematics, pure and applied; in Physics and in Chemistry; in Natural History or Biology, and in Geology. At an early day, if not at the beginning, there will be Professors in History and Metaphysics. Prolonged courses of academic lectures may also be expected from non-resident Professors, now connected with the older colleges of the country.

In respect to their courses of study, freedom of choice will be permitted to the students, but those who are matriculated as candidates for a degree will be held to a strict accountability by a system of examinations, and the diplomas of the University will be bestowed on those alone who have pursued a liberal course of instruction, and have given evidence of their high attainments.

Courses of study will be suggested or prescribed in certain cases. Special instructions may be received by non-matriculated students, who are not candidates for a degree;—and such instruction will be adapted to those who are advanced in their intellectual training, and desirous to avail themselves of the advantages which are offered here. The conditions of admission and graduation will be hereafter announced.

It is hoped that many who have received an education in colleges less liberally endowed or organized upon a different plan, will find in the Johns Hopkins University, peculiar opportunities for the prosecution of *special advanced studies*. When the Faculty has been selected more particular statements will be made of the facilities which may here be enjoyed for such work. In the mean time, letters addressed to the President of the University will receive personal replies.

Prior to the construction of suitable buildings on the proposed University site, temporary lecture- and class-rooms have been provided in the City of Baltimore, adjacent to the City College on Howard St. The University will not provide lodgings for students; but good accommodations may easily be secured in private houses.

HOPKINS SCHOLARSHIPS.

In accordance with the request of the founder of the University TWENTY scholarships, freeing the holders from charges for tuition will be opened at the commencement of the University, to young men who need this assistance. Probably an equal number of Scholarships will be annually bestowed.

The scholarships will be distributed among such candidates "from the States of Maryland, Virginia and North Carolina, as may be most deserving of choice, because of their character and intellectual promise."

Examinations will be held in Baltimore, Richmond, Staunton and Raleigh and perhaps in other places, of such candidates as may present themselves at appointed times during the summer or autumn of 1876. The Examiners will report their marks and opinions to the Trustees,—by whom the scholarships will be awarded. No publicity will be given to the names of those who are appointed or rejected, but a private announcement will be sent to each successful candidate.

These scholarships, which will be known as the "Hopkins Scholarships," may be held for four years; but are liable to be forfeited because of deficiency in scholarship, or of unworthy conduct.

The holders of these scholarships will not be exempted from the special charges usually made in laboratories for materials, etc. or from payments for special personal instruction in case it is required.

The regulations for appointments in future years will not be decided at present.

BALTIMORE CITY COLLEGE SCHOLARSHIP.

It is hoped and believed that other scholarships will be established by private liberality, or by collective subscriptions, for the encouragement of meritorious scholars, and especially to quicken among pupils in high schools and academies, a desire for University education. As an example of such a foundation, (limited to a single competition,) the following announcement is made for the year 1876.

A friend of the Baltimore City College offers a scholarship which may be held for two years, to that student in the City College who shall, near the close of his studies in 1876, pass the best competitive examination in the studies requisite for admission to the University. This scholarship will entitle the holder to ONE HUNDRED DOLLARS annually, at the end of the first and of the second year of his connection with the Johns Hopkins University, provided that his intellectual progress and conduct continue to be honorable. This scholarship may not be held by any student holding a "Hopkins Scholarship." The arrangements for the examination will be made by the Principal of the City College and the President of the Johns Hopkins University.

UNIVERSITY SCHOLARSHIPS.

FIVE scholarships to be known as the "University Scholarships," freeing the holders from charges for tuition, will be awarded to those candidates who shall pass the best competitive examination on the studies requisite for admission to the University. These scholarships shall be open to young men from any part of the country; and may be held for four years, provided that the holders continue to give evidence, which is satisfactory to the Faculty, of their high scholarship and honorable character. The examination for these scholarships will be held in Baltimore, at the commencement of the academic year, in October, 1876, and the names of the successful competitors will be publicly announced.

FELLOWSHIPS.

TEN fellowships, each yielding $500, are offered to college graduates from any part of the country, who exhibit special acquisitions in some branch of science or literature, give promise of great intellectual merit and desire to prosecute higher studies in connection with this University.

At the end of a year, these appointments may be renewed.

The holders of these fellowships are not to engage in the professional study of law, medicine or theology. They will be expected to render some services to the University as Examiners, or as assistants to the Professors, under circumstances to be determined in individual cases.

They may give, for extra compensation, or gratuitously, instruction to such students as desire to receive it under regulations to be hereafter determined; but they will not be permitted to teach outside of the University.

The holders of these fellowships, who may be known as "Associates" or "Fellows," will be expected to reside in Baltimore, engaged in study throughout the academic terms.

USUAL CHARGES FOR TUITION.

The tuition fee will be $80 per annum, payable in two sums of $40 each, the first at the beginning of the academic year, and the second on the first of January. This payment will cover all charges for the general instruction of the University, matriculation, the use of the library, lecture-rooms, etc. There will be a graduation fee of ten dollars.

There will be an extra charge for chemicals, breakage, etc., in the laboratories; special examinations or private instruction in any study may also be made a special charge.

SESSIONS.

The University will be opened to students, Tuesday, October 3, 1876. The Academic year will close in June.

The usual holidays may be expected near the close of the year, and a short recess in the spring.

BALTIMORE, *Jan.* 17, 1876.

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Johns Hopkins University.

SECOND ANNUAL REPORT.

Baltimore, Maryland.

1877.

SECOND ANNUAL REPORT

OF THE

Johns Hopkins University,

Baltimore, Maryland,

JANUARY 1, 1877.

BALTIMORE:
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET.
1877.

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TRUSTEES.

President.

GALLOWAY CHESTON.

Treasurer.

FRANCIS WHITE.

Secretary.

WILLIAM HOPKINS.

Members of the Board.

GEORGE WILLIAM BROWN,
GALLOWAY CHESTON,
GEORGE W. DOBBIN,
JOHN W. GARRETT,
CHARLES J. M. GWINN,
LEWIS N. HOPKINS,
WILLIAM HOPKINS,
REVERDY JOHNSON,
FRANCIS T. KING,
THOMAS M. SMITH,
JAMES CAREY THOMAS,
FRANCIS WHITE.

COMMITTEES.

1876.

Executive Committee:

REVERDY JOHNSON,
JUDGE GEO. W. DOBBIN,
JUDGE GEO. WM. BROWN,
CHARLES J. M. GWINN,
DR. JAMES C. THOMAS,
GALLOWAY CHESTON, *ex officio.*

Finance Committee:

JOHN W. GARRETT,
FRANCIS WHITE,
GALLOWAY CHESTON, *ex officio.*

Building Committee:

JUDGE GEORGE W. DOBBIN,
FRANCIS T. KING,
THOMAS M. SMITH,
LEWIS N. HOPKINS,
GALLOWAY CHESTON, *ex officio.*

Committee in Charge of the Clifton Grounds:

REVERDY JOHNSON,
FRANCIS WHITE,
GALLOWAY CHESTON, *ex officio.*

SECOND ANNUAL REPORT

OF THE

Johns Hopkins University.

To the Trustees of the
Johns Hopkins University:

GENTLEMEN:

IN accordance with your wishes, I here present the second annual report of the President of the Johns Hopkins University. In the period which it covers, we have been chiefly occupied in developing the plans of the organization upon the principles previously adopted; in the construction and adaptation of buildings for instruction and work; in the purchase of books and apparatus; and in the selection of professors and associates.

The conclusions of the Board in respect to the preliminary arrangements were stated in a Minute which was presented by a special Committee on Organization, (consisting of Messrs. George W. Dobbin, Reverdy Johnson, and James Carey Thomas), and was formally adopted by the Board, May 27, 1875. The same committee was charged with the direction of the repairs and enlargements found needful in the Howard street property. The

purchases of books and apparatus and the nomination of officers have come under the special consideration of the Executive Committee. All important and fundamental measures have received the express approbation of the Board, in whose proceedings great unanimity has prevailed.

TEMPORARY SITE OF THE UNIVERSITY.

The property on the south-west corner of Howard and Ross streets, adjacent to the City College, was bought for the University in the summer of 1875. During the past year the requisite alterations and enlargements of the buildings have been made.

The two dwelling houses on the front of the lot have been united under a new roof, and are allotted to the ordinary classes in languages, mathematics, etc. In the rear of the North building, a new structure has been built, which is called "Hopkins Hall." It contains an assembly room, seating comfortably about 200 persons; a library and reading room; and the biological laboratory. In the rear of the South building, in what is termed the "Annex," convenient rooms have been found for the physical laboratory, for the accessory rooms of the library and biological laboratory, and for the janitor's apartments. A separate chemical laboratory has been built upon the rear of the lot. These

structures, which are very simple in their external appearance, are well aired and lighted, are adapted to the present wants of the University, and are capable of enlargement, if that should be found necessary. They have been appropriately furnished and equipped with apparatus.

The chemical laboratory is a distinct building of two stories, standing on a foundation which measures forty-five by sixty-seven feet. In the basement there are rooms for metallurgical work, and for operations requiring bulky and complicated apparatus. On the first floor the main laboratory is placed, a well lighted and well ventilated apartment measuring thirty by forty-two feet, and adapted to thirty students. Near to it, is a smaller laboratory for the advanced students, a balance room, an assistant's room, and two other accessory rooms. On the second floor is the chemical lecture room, (with seats for sixty or seventy students), preparation rooms, special rooms for chemical books and collections, and the private laboratory and study of the Professor of Chemistry.

The biological laboratory situated in the third story of Hopkins Hall, includes one large room, well lighted from the north, and six smaller accessory rooms for the Professor of Biology and for advanced students.

The rooms appropriated to physics are principally in the Annex. They include apartments for special advanced investigations, and also for the work of beginners, with a study for the Professor of Physics. The lecture room for demonstrative lectures in Physics is in the main front building.

A shop for the construction and repair of scientific instruments has been provided in an adjacent dwelling house on Eutaw street.

On the south wall of the assembly room in Hopkins Hall, a brass Memorial Tablet, commemorative of the Founder of the University, bears the following inscription:—

"TO COMMEMORATE THE BOUNTY OF

JOHNS HOPKINS, OF BALTIMORE,

WHO, BY NOBLE GIFTS FOR THE ADVANCEMENT OF LEARNING AND THE RELIEF OF SUFFERING, HAS WON THE GRATITUDE OF HIS CITY AND HIS COUNTRY."

This tablet is the gift of one of the Trustees, Reverdy Johnson, Esq.

THE UNIVERSITY STAFF.

In accordance with their general policy, the Trustees have appointed as yet but a small part of the staff which it is intended to bring together, reserving to a future day the enlargement of the Faculty. The professors entered upon their work at the beginning of the academic year, and have

since that time given valuable counsel not only in respect to their own departments of study, but in respect to the general policy of the University. Their names and departments are as follows:

PROFESSORS.

1. GILDERSLEEVE, BASIL L. . . . . *Greek.*
   A. B., Princt. 1849; A. M., Princt., 1852; Ph. D., Gött., 1853; LL. D., Wm. and M., 1869; Prof. of Greek, Univ. of Va., 1856-76; Prof. of Latin, Univ. of Va., 1861-66.

2. MARTIN, H. NEWELL . . . . . *Biology.*
   M. B., Univ. of Lond., 1871; Dr. Sc., Univ. of Lond, 1872; A. B., Univ. of Camb., 1874; Fellow and late Lect. on Nat. Hist., Christ Coll., Camb.; Fellow of Univ. Coll., Lond.

3. MORRIS, CHARLES D. . . . . *Latin and Greek.*
   A. B., (Worcester Coll.) Oxford, 1849; A. M.; Fellow of Oriel Coll., Oxford, 1852; Prof. in the Univ. of N. Y., 1875-76.

4. REMSEN, IRA . . . . . *Chemistry.*
   Coll. City of N. Y.; M. D. Coll. of Ph. and Surg., N. Y., 1867; Ph. D., Gött., 1870; Prof. of Chem., Wms. Coll., 1872-76, and previously Assist. in Chem., Univ. of Tübingen.

5. ROWLAND, HENRY A. . . . . *Physics.*
   C. E., Renss. Polyt. Inst., Troy, 1870; Assist. Prof. in the same, 1872-75.

6. SYLVESTER, J. J. . . . . *Mathematics.*
   A. M., Univ of Camb.; F. R. S., Lond. & Edin; Corr. Mem. Inst. France; Mem. Acad. of Sci. in Berlin, Gött., Naples, Milan, St. Petersb., etc.; LL. D, Univ. of Dub., Univ. of Edinb.; late Prof. Math. Royal Mil. Acad., Woolwich.

LECTURERS.

In addition to the resident staff of professors, the Trustees have invited the coöperation, for limited periods, of the gentlemen below named, most of whom are connected with other institutions of learning.

Their names are as follows:

1. BILLINGS, JOHN S. (Washington.) . . *History of Medicine.*
   A. B., Oxf., O., 1857; A. M., Oxf, O., 1860; M. D., Cincin., 1860; Assist. Surgeon now in the Surgeon-General's Office, U. S. A., Wash.

2. CHILD, FRANCIS J. (Harvard Univ.) . *English Philology.*
   A. B., Harv., 1846; A. M., Harv, 1849; Ph. D, Gött., 1854; Prof. in Harv. Univ.

3. COOLEY, THOMAS M. (University of Michigan.) . . *Law.*
   LL. D., Univ. of Mich., 1873; Chief Justice of Mich.; Prof. of Law, Univ. of Mich.

4. HILGARD, JULIUS E. (Washington.) . *National Surveys.*
   Assist. in charge U. S. Coast Survey; Pres. Am. Assoc. for Advancement of Science, 1875-76.

5. LOWELL, JAMES R. (Harvard Univ.) . *Modern Literature.*
   A. B., Harv., 1837; A. M., Harv., 1841; D. C. L., Univ. of Oxf. 1873; LL. D., Univ. of Camb., 1874; Prof. of Mod. Lit. in Harv. Univ.

6. MALLET, JOHN W. (Univ. of Virginia.) *Technological Chemistry.*
   A. B., Trinity Coll., Dub., 1853; Ph. D., Gött., 1852; M. D., Univ. of La., 1868, and LL. D., Wm. and M., and Univ. of Miss., 1872; Prof. in the Univ. of Va.

7. NEWCOMB, SIMON. (Washington.) . . *History of Astronomy.*
   B. S., Harv., 1858; Ph. D., Leyden, 1875; LL. D., Columbian Univ., 1874, and Yale, 1875; Prof. of Math. U. S Navy attached to U. S. N. Observ., Wash.; Assoc. of Roy. Ast. Soc., 1872; Cor. Mem. of Inst. of France, 1874.

8. RABILLON, LÉONCE. (Baltimore.) . . . . *French.*
   Bach. ès Lettres, 1832; and Licencié en Droit, 1836, Univ. of France.

9. WALKER, FRANCIS A. (Yale College.) . *Political Economy.*
   A. B., Amh., 1860; A. M., Amh., 1863; A. M., Yale, 1873; Ph. D., Amh., 1875; Prof. in Sheff. Sci. School, Yale Coll.; Sup. U. S. Census of 1870.

10. WHITNEY, WILLIAM D. (Yale College.) *Comparative Philology.*
    A. B., Wms., 1845; A. M., Wms., 1848; Ph. D., Brsl., 1861; LL. D., Wms., 1868; Wm. and M., 1869; St. Andr., 1874; Harv., 1876; Prof. in Yale Coll.

The times appointed for these gentlemen to lecture here are shown in this schedule.

NAME.	No.	BEGIN.	END.	DAYS.	HOUR.
Rabillon, . . .	20	Oct. 5.	Dec. 12.	Tu. Th.	5 o'c.
Newcomb, . . .	20	Nov. 3.	Dec. 18.	M. W. F.	4 "
Billings, ...	10	Jan. 3.	Jan. 16.	Tu. Th.	4 "
Lowell, ...	20	Jan. 31.	Feb. 27.	Daily.*	5 "
Child, ...	20	Jan. 31.	Feb. 27.	Daily.	4 "
Whitney, . . .	20	Mar. 6.	Apr. 6.	T. W. Th. F.	5 "
Hilgard, ...	20	Apr. 9.	May 4.	Daily.	4 "
Walker, ...	20	Apr. 9.	May 4.	Daily.	5 "
Cooley, ...	20	May 7.	June 1.	Daily.	4 "
Mallet, ...	20	May 10.	June 3.	Daily.	5 "

i. e. except Saturday and Sunday.

ASSOCIATES.

Several younger men have also been selected as Assistant Instructors and Associates of the University. Their names are as follows:

1. BRANDT, HERMANN C. G. . . . . *German.*
   A. B., Hamilton, 1872; A. M., 1875; Assist. Prof. Mod. Lang. in Hamilton Coll., 1874-76.

2. BROOKS, WILLIAM K. . . . . *Natural History.*
   A. B., Williams, 1870; Ph. D., Harv., 1875.

3. CROSS, JOHN M. . . . . *Latin and Greek.*
   A. B., Princt., 1867; A. M., Princt., 1870; Tutor of Greek in Princt. Coll., 1873-76.

4. ELLIOTT, ARTHUR M. . . . . *Languages.*
   A. B., Haverford; A. B., Harv. 1868.

5. HASTINGS, CHARLES S. . . . . *Physics.*
   Ph. B., Yale, 1870; Ph. D., Yale, 1873; Holder of the "Tyndall Scholarship," in Paris, 1875

6. MORSE, HARMON N. . . . . *Chemistry.*
A. B., Amh., 1873; Ph. D., Gött., 1875.

7. MURRAY, THOMAS C. . . . . *Semitic Languages.*
A. B., Williams, 1869; A. M., Williams, 1876.

8. RIDGWAY, ROBERT . . . . . *Natural History.*
Collaborator in Nat. Hist. of the Smithsonian Institution, Washington.

9. SCOTT, AUSTIN . . . . . *History.*
A. B., Yale, 1869; A. M., Univ. of Mich., 1870; Ph. D., Leipsic, 1873; late Instructor in Hist. Univ. of Michigan.

10. STORY, WILLIAM E. . . . . *Mathematics.*
A. B., Harv., 1871; Ph. D., Leips., 1875; Late Tutor of Math. in Harv. Coll.

11. TYLER, ARTHUR W. . . . . *Library.*
A. B., Amherst, 1867; A. M., Amherst, 1870; late Assist. Librarian, Astor Lib., N. Y., 1871-76.

12. UHLER, PHILIP R. . . . . *Natural History.*
Librarian of the Peabody Inst., and President of the Maryland Acad. of Sciences.

GRADUATE SCHOLARSHIPS.

In the summer of 1876, the Trustees, wishing to extend the advantages of the foundation to graduates of colleges and advanced scholars from any place, offered twenty Fellowships or Graduate Scholarships, yielding $500 a year and renewable, to be bestowed for excellence in any of the following subjects:

PHILOLOGY,
LITERATURE,
HISTORY,
ETHICS AND METAPHYSICS.
POLITICAL SCIENCE,
MATHEMATICS,
ENGINEERING,
PHYSICS,
CHEMISTRY,
NATURAL HISTORY.

The offer was made in the following terms:

CONDITIONS.

The object of this foundation is to give to scholars of promise the opportunity to prosecute further studies, under favorable circumstances, and likewise to open a career for those who propose to follow the pursuit

of literature or science. The University expects to be benefitted by their presence and influence, and by their occasional services; from among the number it hopes to secure some of its permanent teachers.

1. The applications must be made in writing prior to June 1, 1876. The decision of the Trustees will doubtless be made within a few days subsequently.

2. The candidates must give evidence of a liberal education (such as the diploma of a college of good repute); of decided proclivity toward a special line of study (such as an example of some scientific or literary work already performed); and of upright character (such as a testimonial from some instructor.)

3. The value of each Fellowship will be five hundred dollars, payable in three sums, viz: $100, October 1; $200, January 1; $200, June 1. In case of resignation, promotion, or other withdrawal from the fellowship, payments will be made for the time during which the office may have been actually held.

4. Every holder of a Fellowship will be expected to render some services to the Institution as an Examiner, to give all his influence for the promotion of scholarship and good order, and in general to coöperate in upholding the efficiency of the University as circumstances may suggest. He must reside in Baltimore during the academic year.

5. He will be expected to devote his time to the prosecution of special study, (not professional,) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.

6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.

7. He may be re-appointed at the end of the year.

8. These regulations are prescribed for the first year only.

Out of one hundred and fifty-two applicants, one hundred and seven eligible candidates were selected, comprising graduates from forty-six different colleges. Their applications were referred to specialists in each department, who examined

carefully the claims of the candidates and reported to the Trustees the persons whom they deemed worthy of receiving the appointment.

Two of those who received Fellowships were subsequently appointed Associates, namely, Dr. W. K. Brooks, and Dr. H. N. Morse. One of them, a scholar of unusual promise in the department of Physics, Porter Poinier, S. B., a recent graduate of the Stevens Institute of Technology, died before he received information of his appointment. The list, as finally matured, was as follows:

FELLOWS.

1. ADAMS, HERBERT B. . . . . *History.*
   A. B., Amherst, 1872; Ph. D., Heidelberg, 1876.

2. ADAMS, HENRY C. . . . . *Political Science.*
   A. B., Iowa College, 1871.

3. CLARK, SAMUEL F. . . . . *Natural History.*
   Assistant in Zoology, Yale (Shef. Sci. Sch.) Asst. Zoölogist U.S. Fish Commission, 1874-75.

4. CRAIG, THOMAS . . . . . *Mathematics.*
   C. E., Lafayette, 1875.

5. GORE, JOSHUA . . . . . *Mathematics.*
   C. E., University of Virginia, 1875.

6. HALSTED, GEORGE B. . . . . *Mathematics.*
   A. B., Princeton, 1875; Fellow in Mathematics, Princeton, 1875.

7. HART, EDWARD . . . . . *Chemistry.*
   S. B., Lafayette, 1874; Instructor in Chem., Lafayette Coll.

8. HERING, DANIEL W. . . . . *Engineering.*
   Ph. B., Yale, (She. Sci. Sch.) 1872.

9. ILES, MALVERN W. . . . . *Chemistry.*
   Ph. B., Columbia, (Sch. of Mines,) 1875.

10. JACQUES, WILLIAM W. . . . . *Physics.*
    S. B., Mass. Inst. of Technology, 1876.

11. LANMAN, CHARLES R. . . . . *Philology.*
A. B., Yale, 1871; Ph. D., Leipsic, 1875.

12. MEANS, D. MCGREGOR . . . . . *Political Science.*
A. B., Yale, 1868.

13. PAGE, WALTER . . . . . *Philology.*
A. B., Rand. Macon, 1875; Assist. Prof. of Greek, Rand. Macon.

14. PRESTON, E. DARWIN . . . . . *Engineering.*
A. B., Cornell, 1876.

15. RICE, HENRY J. . . . . *Natural History.*
S. B., Cornell, 1876.

16. ROYCE, JOSIAH . . . . . *Literature.*
A. B., University of California, 1875.

17. SAVAGE, A. DUNCAN . . . . . *Philology.*
B. Litt., University of Virginia, 1870.

18. SIHLER, ERNEST G. . . . . *Philology.*
Concordia, 1869.

19. VANVORST, FREDERICK B. . . . *Ethics and Metaphysics.*
A. B., Princeton, 1875; Fellow in Metaphysics, Princeton, 1875.

20. WHEELER, JOHN H. . . . . *Philology.*
A. B., Harvard, 1871: A. M., 1875.

UNDERGRADUATE SCHOLARSHIPS.

In accordance with the previous announcements and with the Founder's request, the Trustees offered twenty scholarships to students from Maryland, North Carolina and Virginia, found "most deserving of choice because of their character and intellectual promise." Two delegates from the University visited Staunton, Richmond and

Raleigh, in the summer of 1876, for the purpose of making known the conditions of these scholarships to those who were interested in them, and of examining such candidates as applied. The number of candidates at these preliminary examinations was quite small, notwithstanding the advertisements in the public journals. Subsequently, however, a considerable number of applications were received, and scholarships were bestowed by the Trustees on twenty young men, three from Virginia, one from North Carolina, fourteen from Maryland, and two (by exception, as vacancies were found to exist) from Kentucky.

The University Scholarships, which differ from the Hopkins Scholarships in being honors won at examinations, and open to competitors from any place, were awarded by the Faculty, to George W. McCreary, a graduate in 1874, of the Baltimore City College, and to Alldin M. Sprigg, a recent student of St. John's College. The number of competitors was four.

The bestowal of the Baltimore City College Scholarship was postponed with the concurrence of all interested parties, until a later time.

STUDENTS.

It was not expected that the number of students would be large during the earlier years

of the University. Indeed it has been commonly thought desirable, that in this respect, as in others, the University should establish a good nucleus around which, year after year, other good elements may cluster. The completed Register for the year includes the names of 89 students, including 20 who hold Fellowships. Of these, 54 have already received academic degrees; twelve have matriculated as candidates for the Bachelor's degree in this University, and twenty-three have been received as special students. No preparatory department has been organized, and none is contemplated.

Of the graduate students, eighteen have taken the degree of Bachelor of Arts, seven have taken the Baccalaureate degree in Philosophy, Science or Letters, four the degree of Civil Engineer, eighteen the degree of Doctor of Medicine, and seven the degree of Doctor of Philosophy.

These graduates bear diplomas from twenty-five institutions. Five of the diplomas of Doctors of Philosophy were received in Germany; fourteen, of Doctors of Medicine, were received at the University of Maryland; three graduates each are from Amherst, Cornell, Princeton, Yale and the University of Virginia; two each from Harvard, Lafayette, and Washington and Lee, and the others are from twelve American institutions, one from each.

As reported to the University, the homes of these students are as follows:

In Maryland,	57
Massachusetts,	6
Virginia,	6
Illinois,	3
New York,	3
Pennsylvania,	3
California,	2
Kentucky,	2
Indiana,	2
Connecticut,	1
Iowa,	1
New Jersey,	1
North Carolina,	1
South Carolina,	1
	89

OPENING OF THE UNIVERSITY.

The work of the University was inaugurated February 22, 1876, (Washington's Birth Day,) by appropriate exercises in the Academy of Music, which were attended by the Governor of the State, the Mayor of the City, numerous representatives from colleges and other institutions of learning in the Atlantic States, and by a large assembly of the citizens of Baltimore. Special interest was given to the occasion by the Address of the President of Harvard University, the oldest American college, who thus bore testimony to the interest with which this new foundation is regarded in a seat of learning at a distance from Baltimore. The

addresses delivered on this occasion were printed in a pamphlet form and widely distributed.

A special address was subsequently made before an assembly of the youth of Baltimore, in the lesser hall of the Academy of Music, May 27.

During the visit of Professor Huxley to this country, he accepted an invitation from the Trustees to deliver an Address on University Education, in the Academy of Music, on the 12th of September. The discourse was received with marked attention both in this country and in England.

Examinations for admission to the University were first held in Baltimore, July 13th, and were resumed September 13th. The organization of the classes was begun on the 3d of October. On the evening of that day the Trustees, the corps of Instructors, and the Students, assembled in Hopkins Hall, where a familiar statement was made by the President, of the methods of instruction and government which it was proposed to follow. On the following morning the instructions began.

ACKNOWLEDGMENTS.

The public acknowledgments of the University are due to several institutions and persons from whom favors have been received, especially to the Peabody Institute, which has brought to-

gether a library of 60,000 volumes, selected for the use of scholars, on which the University must for a long time, if not always, depend. To the Provost, Dr. Morison, and the Librarian, Mr. Uhler, our thanks are given for many acts of courtesy, personal and official.

The following resolutions indicate the friendly relations of the Trustees of the two Institutions, and give an assurance that each organization will promote the purposes of the other, without interference or reduplication.

The Board of Trustees of the Peabody Institute of the City of Baltimore, at their Annual Meeting, February 12th, 1876,

"In view of the establishment of the Johns Hopkins University in our community, and of the wide field thus opened for the advancement of the intellectual and moral welfare of our people; and, desiring to establish, at the earliest date, affiliation with it in promoting the educational interests of the State:

"*Resolved*, That the Board of Trustees of the Peabody Institute convey to the President and Trustees of the Johns Hopkins University this expression of interest and good will; suggesting that this Institute being, within its scope, an educational element of the State, should be in sympathy with the University, and by interchange of courtesy and coöperation, assist in its high educational aims.

"*Resolved*, That the Secretary address a copy of the Resolutions to the President and Board of Trustees of the Johns Hopkins University."

ATTEST, GEO. P. TIFFANY,
Secretary.

On the reception of the foregoing resolutions, by the University Trustees, it was, on motion

"*Resolved*, That the President and Trustees of the Johns Hopkins University reciprocate, most cordially, the sentiments conveyed in the

communication referred to, and heartily unite in the desire to join hands with the Peabody Institute, in all that could advance the cause of education, refinement and culture in our City and State; and would convey to the President and Trustees of the Peabody Institute, their appreciation of the courtesy which prompted the expressions conveyed in their Resolutions.

"*Resolved*, That the Secretary be requested to remit a copy of the Resolution to the President and Trustees of the Peabody Institute."

ATTEST, WILLIAM HOPKINS,

Secretary.

From the Secretary of the Smithsonian Institution, Prof. Henry, and the Assistant Secretary, Prof. Baird, repeated assurances have been received of their interest in the University, and of their desire to render the National collections of service to the University.

The Library of the Maryland Historical Society, and the Library of the Mercantile Library have also been of much service to us. In the rooms of the Maryland Historical Society, a class of students of American history have found available an excellent collection of documents and memoirs.

The University has also received some noteworthy gifts.

On the death of Dr. Henry Willis Baxley, a well known physician of Baltimore, which occurred March 13th, 1876, it was found that he had made the University his residuary legatee, for the purpose of establishing in the Medical department a professorship of Medicine. It will be appropriate

to refer more particularly to this bequest and to the generous purposes of the donor, after the settlement of the estate which is at present in litigation.

From the India Office, in London, the Library received a very important collection of books, chiefly Sanskrit texts, and works illustrative of them. This generous gift was particularly welcome.

From a native of Baltimore, Henry Holt, Esq., now a Publisher in New York, more than one hundred valuable volumes which have been issued by the firm to which he belongs, were received.

Mrs. Burr Porter, of Boston, presented a set of the Reports of the British Association, which belonged to her relative the late Porter Poinier, a Fellow of this University.

Mrs. Jared Sparks presented a set of the North American Review, and some other works of value from the library of the late President Sparks of Harvard University.

From Hon. A. Bowie Davis, Reverdy Johnson, Esq., Mr. Thomas C. Murray, and others, numerous gifts have been received, a list of which is given in the Appendix.

TAXATION.

The last Assembly of Maryland passed an Act revising the State system of taxation. By its general provisions the University property became

liable to taxation, and its income has thus been materially reduced. The following remonstrance to the Act was presented before its passage.

To the Honorable, the General Assembly of Maryland:—

The Trustees of the JOHNS HOPKINS UNIVERSITY respectfully present the following petition.

A citizen of Baltimore has founded, on a liberal basis, free from ecclesiastical and partisan control, an institution of the highest sort for the instruction of youth. He has given a University to Maryland.

In other enlightened states, such institutions have been regarded as worthy to receive from the public treasury liberal appropriations for their foundation and maintenance; because it has been conceded that universities promote the prosperity and happiness of the communities where they are placed,—the wealth, the strength, the influence, and the virtue of the people.

From the obligation to establish a University, Maryland has been freed by this act of a citizen, who has provided, by his sole bounty, such an endowment as has been accumulated in the older communities by generations of economy and self-denial; such an endowment as the newer states have not equalled by their munificent land grants and their direct appropriations from the public chest.

The benefit of this new foundation will extend far beyond the students who come under its instruction; its funds will be devoted to the promotion of all useful knowledge; its advantages will be open to students who are preparing for any educated calling; its trustees are serving without any recompense except the consciousness of promoting the public good. Among other services, the new university will be of especial advantage to the school system of the State, inspiring their scholars and training their teachers.

In other states, irrespective of public grants, incorporated and endowed universities have been recognized as of such high and exceptional utility, that their property has been exempted from taxation.

The argument for such exemption is brief but clear. It is of no gain to the state to lay a tax upon that which is devoted to the service of the state. The people would not be benefitted but injured by a tax upon roads, parks, courthouses, hospitals and other property solely devoted to the public good.

The taxation of a university discourages benefactions, while its exemption from taxation encourages gifts.

Erroneous notions are prevalent in respect to the income of this university. It is less than is absolutely essential for the immediate needs of the institution which it is proposed to create; less than that of Harvard,

Yale or Columbia College. Diminution of this income by taxation will diminish to just that extent the usefulness of the foundation.

Your petitioners therefore pray that the property of the JOHNS HOPKINS UNIVERSITY be exempted from taxation.

(Signed,) GALLOWAY CHESTON, REVERDY JOHNSON, THOMAS M. SMITH, J. CAREY THOMAS, GEORGE W. DOBBIN, GEORGE W. BROWN, JOHN W. GARRETT, FRANCIS T. KING.

BALTIMORE, *March 24th, 1876.*

A Report of the progress of the instruction during the current year, is deferred till the next annual statement.

Respectfully submitted,

D. C. GILMAN,

President of the Johns Hopkins University.

JANUARY 1, 1877.

APPENDIX.

A.

Minute adopted by the Board, May 25, 1875.

[Two paragraphs subsequently modified, are omitted.]

Time and Place of Beginning.

1. The instructions to be given by the Johns Hopkins University will commence in the buildings in Howard street recently purchased by the Trustees; but this shall be regarded as only a temporary arrangement until plans can be formed for the permanent buildings of the University and these buildings in part at least constructed. Instruction will commence in October, 1876, and continue till the following June.

Improvement of the Howard St. Property.

2. This Committee shall have power to make such alterations in the interior of the Howard street property as will adapt it to the immediate needs of the University, and to provide for it the necessary furniture.

Literary and Scientific Department to be First Considered.

3. The organization of the departments of medicine and law shall be postponed; and the first attention of the President and of the Committee shall be directed to the departments of literature and science.

Establishment of a Reserve Fund.

4. As the conditions of the foundation do not permit the use of any portion of the capital for buildings, the Trustees will establish a "Reserved Accumulating Fund" to which the unappropriated income shall be transferred for the requirements in building, and for such other purposes as the Board may hereafter determine.

RELATIONS OF THE FACULTY TO THE TRUSTEES.

5. The organization of the literary and scientific classes of the University shall proceed gradually. When the conclusions of the Board are matured on questions of administration and government, these conclusions shall be formally adopted as the principles by which the University will be governed,—but the detailed methods by which these principles must be carried out, shall chiefly rest with the Faculty, subject to the approval of the Board.

ESTIMATED EXPENSES OF INSTRUCTION.

6. As an approximate estimate of the outlays to be incurred for instruction at the beginning of the University the following sums are designated, subject to such modifications as the future may determine:

For the year 1876–7, a sum not exceeding $60,000; for 1877–8, $75,000; for 1879–80, $90,000.

NOMINATION OF PROFESSORS.

7. The Executive Committee shall forthwith direct the President to make inquiries in respect to the selection of Professors and Instructors, and this committee shall report to the Board, next autumn, the result of these inquiries, with the names of such persons as they recommend for appointment. An interval of two weeks shall pass after such a report is made before the Board proceeds to the election of any permanent professor.

THREE CLASSES OF TEACHERS.

8. The Committee shall have in mind the appointment of three classes of teachers:

CLASS I, the permanent Professors, on whom will rest the chief responsibility of instruction and government, and who will be expected to give to the University their time and strength.

The effort shall be made to secure the services of men of acknowledged ability and reputation, who are distinguished in special departments of study and who are capable of advancing these departments and of inciting young men to study and research. Among the number should be some who can be especially helpful

in the organization of the University, and in influencing the character of young men.

CLASS II will include Professors and Lecturers, resident or non-resident in Baltimore, who will give but a limited amount of time and service to this University, and who will not be expected to take part in the administrative work. These instructors should be men of attainments in specialties which do not at present require full professorships, and men whose marked ability will be of service to the University. Professors in other colleges may thus be called to the Johns Hopkins University for a portion of the year, and possibly men from other lands.

CLASS III will include Adjuncts and Assistants, who will usually be appointed for periods varying from one to five years. Their work will be chiefly subordinate to and in connection with the work of the permanent professors, who should be consulted in respect to their selection. The effort should be made to secure young men of ability and promise from whom the staff of permanent teachers may be in time reinforced.

SECTARIAN AND POLITICAL TESTS.

9. In the appointment of the Faculty care shall be taken to avoid sectarian and political influences, and the effort shall be made to bring together a staff of teachers who are known and esteemed in different parts of the country.

DEPARTMENTS OF INSTRUCTION.

10. Among the earliest departments of instruction to be provided are the following:

1. ANCIENT LANGUAGES, including Greek, Latin, Comparative Philology, etc.

2. MODERN LANGUAGES, including English, French, German, Spanish, Italian, etc.

3. MATHEMATICS, including Pure and Applied.

4. PHYSICAL SCIENCES, including Chemistry and Physics.

5. NATURAL SCIENCES, including Geology, Mineralogy, Zoology and Botany.

6. MORAL AND HISTORICAL SCIENCES, including Ethics, Political Economy, History, International and Public Law, etc.

BOOKS AND APPARATUS.

11. The Executive Committee shall have authority to secure such books and apparatus as may be needed for the immediate work of the University, consulting with the professors in different departments as they may be appointed.

It is presumed that at the outset the following sums may be requisite:

For books,* $5,000; for chemical and philosophical apparatus, $10,000; for scientific collections, $10,000; for diagrams, maps, photographs, $5,000;—$30,000.

REQUISITES FOR ADMISSION AS STUDENTS.

12. No person shall be enrolled as a student in the University until he has completed sixteen years of age, and has given to the authorities satisfactory evidence, on examination or otherwise, that he is proficient in those preliminary studies required for admission to the best colleges and schools of science in the country; and he shall further, before his admission to any special courses of study which may be established in the University, satisfy the authorities by examination that he is qualified to pursue said special courses.

DEGREES.

13. The examinations for degrees shall be strict and comprehensive. The degreee of B. A. shall be given for proficiency in classical studies, and that of B. Ph. for proficiency in scientific studies; but these degrees shall represent an equal amount of hard study pursued in different directions, and shall be coördinate in rank; and the candidates for these degrees shall have equal consideration in all the plans of the University. The second degree of Master of Arts and of Doctor of Philosophy shall be given on examination only, at an interval of at least two years subsequent to the first degree.

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* With reference to the small amount suggested for the Library it should be said that the Peabody Library will for a time be the chief reliance of the University for costly books; and with reference to scientific collections it should be said that much may be secured by engaging the services of naturalists who will enter upon the work of collecting in the field and establishing a system of exchanges.

SPECIAL ADVANCED INSTRUCTION.

14. Special facilities and encouragement shall be given to the graduates of colleges to come and profit by the instructions here provided, with or without reference to professional work or to the taking of a second degree. The effort shall thus be made to extend the benefit of the University to distant parts of the land, though it is also thought that many residents of Baltimore will be glad to avail themselves of such opportunities.

SCHOLARSHIPS.

15. The scholarships provided by the founder shall be bestowed in part publicly, as the result of a competitive examination, and in part privately as an aid to the needy. These scholarships shall exempt the holder from any charge for tuition. Scholarships dependent on merit shall not be held longer than two years without reëxamination and competition; other scholarships shall be annually bestowed.

B.

Organization of the Library.

REPORT.

President D. C. GILMAN,

SIR: It is my duty to report the completion of the organization of the Library on the plan and within the appropriation of the Board of Trustees. A full statement of the expenditures and arrangement is appended.

Up to the first of April, 1876, when I was placed in charge, there had been collected about 250 volumes, chiefly works on education, for use in the offices of the University. The month of April was spent in a careful examination of the methods of arrangement in several prominent libraries of the country. Early in May the lists of books for purchase were prepared, and these were mostly ordered from England and Germany through the usual channels. At the same time some favorable purchases were made in this country; worthy of mention is that of a large portion of the French exhibit of books at the International Exhibition at Philadelphia. In August we began to receive our purchases, which were placed in temporary rooms for classification and cataloguing. In October the permanent rooms of the Library were occupied and the books arranged in their present position.

In the organization of the Library several principles were clearly marked out by the Trustees, viz:

1. To gather a small reference library of such books as it was essential to have constantly at hand; and to supplement this, from time to time, as the growth and needs of the University should render necessary.

2. To collect for the different departments special libraries to be placed apart for their ready use and reference.

3. To render accessible, by an arrangement with the other libraries of Baltimore, all valuable periodicals in the various branches of scholarly research.

4. To secure for the members of the University an opportunity for the inspection of noteworthy books of general interest, whose purchase was not included in the plan of the library proper.

5. To arrange the library in rooms easy of access, and open for reading and study during such hours of the day and evening as would be convenient for all.

These plans have, in the main, been successfully worked out.

GENERAL LIBRARY.

There have been purchased 3,142 volumes, at an average cost, binding included, of $2.40 per volume, a rate which may be considered very favorable in view of the class of books collected. In these purchases care has been exercised to make the library encyclopædic in character, and in this respect it compares favorably with many of our larger libraries.

A small collection of the standard texts and works of reference in use in the University has also been formed. No book has been bought as a rarity, but the endeavor has been made in every case to secure the latest or the most approved edition.

There have been presented 859 volumes, a detailed statement of which is annexed. Particular mention should be made of the gift of a most valuable collection of Indian literature by the India Office, London; of a full and choice selection from his publications by Henry Holt, Esq., of New York; of a set of the North American Review and some valuable pamphlets by Mrs. Jared

Sparks, of Cambridge, Mass.; of rare books on the history of Maryland, by Hon. A. B. Davis, of Montgomery County, Md.; and of works on History and Roman Law, by Reverdy Johnson, Esq., of Baltimore.

A few of the officers of the University have deposited their own books with the Librarian, under guaranty of safe keeping and return upon proper notice. This arrangement is considered mutually beneficial as securing to the library valuable books not otherwise procurable, and to the owner ease of access and proper arrangement with books of the same class. There are on our shelves 469 volumes thus deposited.

The Library contains in all 4,600 bound volumes, and 315 unbound pamphlets. Orders now outstanding will increase the number to over 5,000 volumes. The entire collection has been collated, catalogued, and so arranged as to be readily accessible.

SPECIAL LIBRARIES.

Beginnings have been made in special libraries for several of the departments, whose books are for the present kept in the general library. Under a separate appropriation quite a complete collection has been bought for the Chemical department, which will be placed in the rooms of the laboratory. This promises to be one of the most useful features of the library; and it is hoped that there will grow up around each department of the University a complete apparatus of books suited to its needs.

PERIODICALS.

The Library now receives 207 serial publications. Periodicals taken in the other libraries have not, save in a few instances, been duplicated; but the effort has been so to supplement the lists of the other institutions as to render accessible, somewhere in the city, every journal of scientific or literary value. In November a Finding List of Periodicals and Serials, taken at the different

libraries of Baltimore, which included 511 titles, was issued. A new edition enlarged by about 200 titles and a subject index will shortly be published.

NEW BOOKS.

Under an especial appropriation, the best of the new books appearing from time to time are secured. These are placed in a separate section, and are loaned under certain restrictions. They are retained for three months and then sold at a reduced rate. This plan has approved itself and, probably, will be largely self-supporting.

ARRANGEMENT.

The arrangement of the Library is novel and attractive. In the main room the books of reference in greatest demand are arranged on shelves, convenient of access. The periodicals and new books are also here. The room is carpeted, and well-furnished, and in every respect is an inviting centre for the members of the University. Opening from this is a suite of five smaller rooms, the first of which is used as the Library working room. In the remaining four are placed the special libraries. These are provided with convenient desks, so that the student may gather around him the books of his department and secure uninterrupted quiet. All the rooms are well heated and lighted, and remain open from 9 A. M. until 10 P. M.

The permanent charge of the Library has been placed in the hands of Mr. Arthur W. Tyler, late of the Astor Library, New York.

THOMAS C. MURRAY,
Associate in Charge of the Library.

JOHNS HOPKINS UNIVERSITY,
Baltimore, January 1st, 1877.

C.

List of Donors to the Library,

Prior to January 1, 1877.

ACOLLAS, ÉMILE. (*The Author.*) Paris.

Manuel de droit civil. 3 v. Paris, 1874. 8vo.

ALLEN, E. G. London.

Reference catalogue of current literature. London, 1874. 8vo.

AMMEN, S. Z. (*The Author.*) Baltimore.

Latin grammar for beginners. New York, 1876. 8vo.

ASTOR LIBRARY. New York.

Astor Library annual reports. Albany, 1850–1876. 8vo.

AUSTEN, P. T. (*The Author.*)

Kurze Einleitung zu den aromatischen Nitroverbindungen. Berlin, 1876. 8vo. pph.

Ueber Dinitroparadibrombenzole. Berlin, 1876. 8vo.

AVERY, JOHN. (*The Author.*) Professor of Languages, Iowa College. Grinnell, Iowa.

Contributions to the history of verb-inflection in Sanskrit. [New Haven. 1875.] 8vo.

BALTIMORE, (SCHOOL COMMISSIONERS OF.)

Reports of the Board of School Commissioners of Baltimore. 1870–1875. 6 v. Baltimore, 1870–75. 8vo.

BARBEE, W. J. (*The Author.*) Professor, Ghent College. Ghent, Kentucky.

First principles of geology. Louisville, 1868. 12mo.

BASCOM, JOHN. (*The Author.*) President of the University of Wisconsin. Madison, Wisconsin.

Philosophy of religion. New York, 1876. 8vo.

BILLINGS, J. S., M. D. (*The Author.*) Washington, D. C.

Specimen fasciculus of a catalogue of the National Medical Library Washington, 1876. 4to. pph.

BLAND, THOMAS. New York.

ADAMS, C. B., *Catalogue of shells collected at Panama.* New York, 1852. 4to.

BLASIUS, WILLIAM. (*The Author.*)

Storms; their nature, classification and laws. Philadelphia, 1875. 8vo.

BOLTON, H. C. (*The Author.*) Associate Professor of Chemistry, School of Mines, Columbia College. New York.

Index to the literature of manganese, (1596–1875.) Salem, 1876. 8vo.
Index to the literature of uranium. Salem, 1870. 8vo.

BOSTON SOCIETY OF NATURAL HISTORY. (At the request of the Centennial Commissioner for Massachusetts.)

CROSBY, W. C., *Report on the geological map of Massachusetts.* Boston, 1876. 8vo.

BROWNNE, R. H. New York.

MONTGOMERY, JAMES, *Sacred poems and hymns.* New York. 1854. 12mo.

BRUSH, G. J. Professor of Mineralogy, Sheffield Scientific School, Yale College. New Haven, Ct.

Reports of the Sheffield Scientific School, (1866–1875.) New Haven, 1866–1875. 8vo.

CLARK, J. G. (*The Author.*) Professor, William Jewell College. Liberty, Mo.

Elements of the infinitesimal calculus. New York, (1875.) 8vo.

CLARKE, F. W. (*The Author.*)

Constants of nature. Washington, 1873–76. 4 Parts. 8vo.

CHESTON, GALLOWAY. Baltimore.

RIVERS, W. J. *A chapter in the early history of South Carolina.* Charleston, 1874. 8vo.

CHISHOLM, J. J., M. D. Baltimore.

LABORDE, M., *History of the South Carolina College.* Charleston, 1874. 8vo.

CHASE, P. L. (*The Author*) Professor of Philosophy, Haverford College. West Haverford, Pa.

On some fundamental propositions of central force. [Philadelphia, 1876.] 8vo. pph.

COLIN, ALFRED. (*The Author.*) New York.

Universal metric system. New York, 1876. 8vo.

COOPER, ELLWOOD. (*The Author.*) Santa Barbara, Cal.

Forest culture and eucalyptus trees. San Francisco, 1876. 12mo.

CUSHINGS & BAILEY. Baltimore.

Baltimore handbook of colleges, schools, libraries, etc. Baltimore, 1876. 12mo.

Trade list annual for 1875. New York, 1875. 8vo.
" " " " *1876.* " 1876. "

DALE, T. N. (*The Author.*) Paterson, N. J.

Rhaetic strata of the Val di Ledro. Paterson, 1876. 8vo. pph.

DAVIS, HON. A. B. Montgomery County, Md.

Book of common prayer. [1728.] 8vo. [*No title*]
BATES, E., *Christian politics.* London, 1806. 8vo.
BURGH, J., *Political disquisitions.* Vol. I. Philadelphia, 1775. 8vo.
CARE, H., *English liberties.* London, 1719. 8vo.
Constitution of the United States. Philadelphia, 1791. 12mo.
HERTY, T., *Digest of the laws of Maryland.* Baltimore, 1799. 8vo.
JONES, F. C., *New pocket conveyancer.* 2 v. Dublin, 1794. 12mo.
Laws of Maryland, [1634–1763,] ed. T. Bacon. Annapolis, 1765. fol.
[1763–1785,] " 1787. "
ed. W. Kilty. 2 v. Annapolis, 1799–1800. 4to.
Laws of the United States. 3 v. Philadelphia, 1796. 12mo.
SMITH, ADAM, *Wealth of nations.* 3d ed. 3 v. London, 1784. 8vo.
Trial of Hon. Samuel Chase. Baltimore, 1805. 8vo.

DECANVER, H. C. (*The Author.*)

Catalogue of works in refutation of Methodism. New York, 1868. 8vo.

DE FOREST, E. L. (*The Author.*) Watertown, Ct.

Interpolation and adjustment of series. New Haven, 1876. 8vo. pph.

DONALDSON, S. C. Baltimore.

MEYER, LEO, *Vergleichung der griechischen und lateinischen Declination.* Berlin, 1862. 8vo.

DONALDSON, W. A.

Notes on Portugal, by E. A. G. Philadelphia, 1876. 8vo.

DUBOIS, A. J. (*The Author.*) Professor of Civil and Mechanical Engineering, Lehigh University. Bethlehem, Pa.

Elements of graphical statics. 2 v. New York, 1875. 8vo.
New method of graphical statics. New York, 1875. 8vo.

DURFEE, C. A. Astor Library, New York.

COLVIN, VERPLANCK. *Report of the topographical survey of the Adirondack wilderness, for 1873.* Albany, 1874. 8vo.

EDUCATION, U. S. COMMISSIONER OF. Washington, D. C.

Public libraries in the United States. Parts 1 and 2. Washington, 1876. 8vo.

Reports of the Commissioner of Education. 1872–1874. 3 v. Washington, 1873–75. 8vo.

ELDREDGE & BRO. (*Publishers.*) Philadelphia, Pa.

GREGORY, D. S., *Christian ethics.* Philadelphia, 1875. 8vo.

FRIEDLÄNDER & SOHN. (*Publishers.*) Berlin, Prussia.

Bibliotheca historico-naturalis et mathematica. Berlin, 1874. 8vo.

FRIENDS' BOOK ASSOCIATION. Philadelphia.

Peace principles in the history of Pennsylvania. Philadelphia, 1876. 8vo.

GILMAN, PRESIDENT D. C., Baltimore.

American journal of science and arts. New Haven. 2d Series, 50 v. 8vo. 3d Series, Vols. I–II, 2 v., 8vo.

Année géographique, (L') Paris, 1863–73. 6 v. 12mo.

Bulletin de la société de géographie. 4e série. Paris, 1851–58. 15 v. 8vo.

Geographisches Jahrbuch. Gotha, 1866–74. 4 v. 12mo.

GNEIST, R., *Englische Communalverfassung oder der Self-government.* Berlin, 1863. 2 v. 8vo.

Journal of the royal geographical society. London, 1831–54. 22 v. 8vo.

Mittheilungen aus Justus Perthes geographischer Anstalt, von A. Petermann. Gotha, 1855–74. 25 v. 4to.

O'CALLAGHAN, E. B., *Documentary history of New York.* Albany, 1850–51. 4 v. 8vo.

Reports of the United States coast survey. Washington, 1852–71. 14 v. 8vo. and fol.

Zeitschrift für allgemeine Erdkunde. Berlin, 1853–63. 12 v. 8vo.

Also ninety-five volumes not enumerated.

GURNEY, MRS. ELIZA P. Burlington, N. J.

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Principles of chemistry. Davenport, Iowa, 1874. 8vo.

HOLT, HENRY. (*Publisher.*) New York.

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College hymnal. New York, 1876. 16mo.

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Sacred anthology. " " "

COQUEREL, ATHANASE, *Historical transformations of Christianity*, tr. by E. P. Evans. Boston, 1876. 12mo.

Critical and social essays reprinted from the Nation. New York, 1867. 16mo.

DEUTSCH, EMANUEL, *Literary remains of.* New York, 1874. 8vo.

DICKENS, CHARLES, *Our mutual friend*, condensed by R. Johnson. New York, 1876 16mo.

DROZ, G., *Around a spring.* New York, 1876. 16mo.
Babolain. New York, 1876. 16mo

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Literary and social judgments. New York, 1876. 12mo.

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HEINE, HEINRICH, *Book of songs*, tr. by C. G. Leland. New York, 1874. 16mo.

Pearls from. Philadelphia, 1865. 4to.

Scintillations from prose works of, tr. by S. A. Stern. New York, 1873. 16mo.

HERTZ, HENRIK, *King René's Daughter*, tr. by F. Martin. New York, 1870. 16mo.

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Early history of institutions. New York, 1875. 8vo.

Village communities in the east and west. New York, 1876. 8vo.

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New affinities of faith. Boston, 1869. 12mo.

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Dissertations and discussions. 5 v. New York, 1874–75. 8vo.

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History of English literature, tr. by H. Van Laun. 3v. New York, 1876. 12mo.

Italy—Florence and Venice, tr. by J. Durand. New York, 1875. 12mo.

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WALKER, F. A., *Wages question.* New York, 1876. 8vo.

WEEKS, R. K., *Episodes and lyric pieces.* New York, 1870. 16mo.
Twenty pieces. New York, 1876. 16mo.

WINTHROP, THEODORE, *Canoe & saddle.* New York, 1876. 16mo.
Cecil Dreeme. New York, 1876. 16mo.
Edwin Brothertoft. New York, 1876. 16mo.
John Brent. New York, 1876. 16mo.
Life in the open air. New York, 1876. 16mo.

HOTCHKISS, JED. Staunton, Va.

Virginia. A geographical and political summary. Richmond, 1876. 8vo.

HUNT, PROF. T. S. (*The Author.*) Boston, Mass.

Chemical and geological essays. Boston, 1875. 8vo.

HURD & HOUGHTON. (*Publishers.*) New York.

PICKERING, E. G., *Elements of physical manipulation. Part II.* New York, 1876. 8vo.

ILES, M. W. Baltimore.

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APPROVED *March 22, 1876.*

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THIRD ANNUAL REPORT.

Baltimore, Maryland.

1878.

THIRD ANNUAL REPORT

OF THE

Johns Hopkins University,

Baltimore, Maryland,

1878.

BALTIMORE:
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET.
1878.

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To the Trustees of the
Johns Hopkins University:

GENTLEMEN:

At your annual meeting, January 7th, 1878, the third annual report of the President of the University was presented and read. Its publication was deferred, by your consent, that it might include a review of the work of the University during the first two years of instruction, and that hereafter each annual report might cover the period of an academic and not of a civil year. This enlarged report I now lay before you with such details as seem likely to be of interest and use to the members of the University or to the public at large, and with some preliminary observations which may serve to interpret the character of our undertaking to those who observe us from a distance.

It is desirable that the friends of this University, whether they are men of learning engaged

in the advancement of literature or science; or are citizens interested in the development of a public benefaction; or are parents planning for the education of their sons; or are teachers watching the growth of a new foundation, should clearly understand the principles which have governed the authorities in their administration of this trust; and in order that they may, it will be necessary to recur to some statements already made in other connections.

Our founder gave no limitations to his representatives in respect to the interpretation of the word "University." This term has been applied so differently in various parts of this country, and the University types differ so much in Europe, that it would not have been strange if serious diversities of opinion had arisen among us. Fortunately the Trustees have acted with complete unanimity.

From the beginning, they refused to be governed by personal, local, or sectarian predilections, and endeavored to carry out the generous purposes of the founder by organizing an institution which should aim at the highest good possible under the existing circumstances, and should thus be of benefit to all this land and even to the world of science and letters. They hoped that the public influence of the foundation would first be felt in Baltimore, next in the regions most closely connected with

this city, and finally, at a distance. They were in no haste for immediate results.

In studying the problem committed to them for solution, they soon perceived that there was no obvious call for another "college," using that word in the sense commonly given to it in the educational vocabulary of this country. A few students might doubtless be brought to Baltimore who would otherwise go to Princeton or the University of Virginia, or to some other neighboring institution, and thus the sentiments of rivalry or jealousy might be quickly developed; but there would be no advantage to literature, science or education from adopting such a course. There are already quite enough places in the Atlantic States, for the discipline of young men in the elements of a liberal education, and especially in those preliminary studies, linguistic and mathematical, which are characteristic of American colleges.

Again, there was no call for another technological or scientific school. Liberal benefactions, aided in many cases by the land-grant of the general government, have established within the last twenty-five years excellent foundations for the study of science in its applications to human industry,—schools of chemistry, engineering, mining, mechanics, agriculture and the like. There was even danger that in the struggle for life, many of these new schools would give way to the few which

are really strong. On the other hand, there seemed to be a demand for scientific laboratories and professorships, the directors of which should be free to pursue their own researches, while at the same time stimulating their students to prosecute study with a truly scientific spirit and aim.

When attention was given to the state of professional education,—it was clear that this was not the time or place to establish a theological department, however much might be said upon the advantages of providing for theological science in the university spirit, and of encouraging the study of Christian doctrine free from denominational or sectarian restrictions. In respect to the study of law and medicine, facilities were already afforded in Baltimore, closely corresponding with those which are enjoyed in other cities of this country; and although these facilities might doubtless be increased by liberal appropriations of money, there were good reasons for postponing any movement in this direction, while the University of Maryland, a corporation of age, dignity, and influence, was in possession of the field, giving lectures and instruction in both these departments; and while in medicine there were in Baltimore two other schools (since combined) providing lectures and bestowing degrees. The establishment of a hospital by the founder of the University had indeed indicated his purpose to promote the advancement of medical

science,—but his Trustees early concluded that the methods to be adopted might be wisely left for future determination, when the hospital structure should approach completion. As an aid to these discussions, Dr. J. S. Billings, Surgeon, U. S. A., of Washington, who is the medical adviser of the Hopkins Hospital Trustees, was invited to give before the University, a course of lectures on Medical Education, and related topics. He did so in the autumn of 1877, and those portions of the lectures which seemed to have the greatest public interest have since been printed in a pamphlet.

Finally, a continuance of their inquiries led the Trustees to believe that there was a strong demand, among the young men of this country, for opportunities to study beyond the ordinary courses of a college or a scientific school; particularly, in those branches of learning not included in the schools of law, medicine and theology. The strongest evidence of this demand was afforded by the increasing attendance of American students upon the lectures of the German Universities. Another sign was given by the enrolment of "post graduates" not only at Harvard and Yale, where generous opportunities were given for graduate study, but also in colleges where the resident staff were thoroughly absorbed in their ordinary collegiate work, and were really not free and fresh for the syste-

matic guidance of graduate students. A third indication of the need of arrangements for advanced study was afforded by the great difficulty, (privately avowed in many of the best colleges), of obtaining superior professors as vacancies occur. There are always candidates enough,—candidates of intellectual and moral worth,—but the men of mark, who show that they are likely to advance the sciences they profess, and are likely to become recognized authorities among their peers at home and abroad, are very few. In Maryland, and many other parts of the country, south and west, there are chartered colleges, which may reasonably be expected to provide instruction in mathematical and classical studies,—but which cannot give in an efficient way, instruction in those branches of science which require costly apparatus, large libraries, scientific journals. There were indications that many young men would begin their higher studies in such colleges near to their own residences, and would afterwards come to Baltimore, if sufficient attractions were offered, for the prosecution of their work.

These considerations led to the conclusion that THE PHILOSOPHICAL FACULTY OF A UNIVERSITY, to give instruction of a superior character in mathematics, science and language, should be the first object of our care. To this department we hoped that students who had already been

taught in other colleges, would be drawn by the eminence of the professors and the excellent opportunities for advanced study to be afforded in Baltimore. The experience of two years has confirmed the wisdom of this decision.

At the same time, and with equal certainty, the Trustees were persuaded that the youth of Baltimore had particular claims upon the Hopkins foundation, and that they should not be compelled to go away from home, in order to be fitted to enter the new institution established at their doors. Fortunately in the Baltimore City College, instruction in mathematics was carried quite far enough for the ordinary student, and there were good opportunities to begin the study of languages and science. Arrangements were therefore made for the reception of graduates of the Baltimore City College, and of other scholars coming from the private schools of the city. Courses of study leading to the Baccalaureate degree were marked out for such students,—and certain special modifications of the traditional college were introduced, which have been regarded with favor in older institutions, and seem to be particularly well adapted to the needs and wishes of this community.

In determining to give prominence to the University rather than to the College, the Trustees were early led to the study of the best institutions of this and other countries. They informed themselves, by

prolonged interviews with the Presidents and by visits to several institutions, of the views which were held in the Universities of Cambridge, New Haven, Ithaca, Michigan, Pennsylvania, Virginia, and elsewhere. They were made acquainted with the drift of the educational discussions in Great Britain, Germany, Austria, France, and other European countries; and they determined not to follow exclusively any precedent,—not to attempt to found a German University, or a French or an English,—but to derive from all sources such experience and recommendations as might be adapted to this country and lead in course of time to an American University based upon our own educational system, and fitted to meet the wants of our own scholars. Any one who will watch the development of the Hopkins plans will be likely to perceive peculiarities distinguishing this foundation from any other. But the authorities may also claim that there has been no seeking after novelty,—no desire to make experiments which have already been fairly tested and rejected,—no inclination to go counter to the experience and judgment of wise and successful teachers elsewhere,—no disposition to rival any other establishment. As a consequence of this policy, the interest and sympathy and in some cases the hearty coöperation of other institutions has been freely given to this.

The terms university and college have been so frequently interchanged in this country that their significance is liable to be confounded; and it may be worth while, once more at least, to call attention to the distinction which is recognized among us. By the college is understood a place for the orderly training of youth in those elements of learning which should underlie all liberal and professional culture. The ordinary conclusion of a college course is the Bachelor's degree. Usually, but not necessarily, the college provides for the ecclesiastical and religious as well as the intellectual training of its scholars. Its scheme admits but little choice. Frequent daily drill in languages, mathematics and science, with compulsory attendance and frequent formal examinations, is the discipline to which each student is submitted. This work is simple, methodical and comparatively inexpensive. It is understood and appreciated in every part of this country.

In the university more advanced and special instruction is given to those who have already received a college training or its equivalent, and who now desire to concentrate their attention upon special departments of learning and research. Libraries, laboratories and apparatus require to be liberally provided and maintained. The holders of professorial chairs must be expected and encouraged to advance by positive researches the

sciences to which they are devoted; and arrangements must be made in some way to publish and bring before the criticism of the world the results of such investigations. Primarily, instruction is the duty of the professor in a university as it is in a college; but university students should be so mature and so well trained as to exact from their teachers the most advanced instruction, and even to quicken and inspire by their appreciative responses the new investigations which their professors undertake. Such work is costly and complex; it varies with time, place and teacher; it is always somewhat remote from popular sympathy, and liable to be depreciated by the ignorant and thoughtless. But it is by the influence of universities, with their comprehensive libraries, their costly instruments, their stimulating associations and helpful criticisms, and especially their great professors, indifferent to popular applause, superior to authoritative dicta, devoted to the discovery and revelation of truth, that Knowledge has been promoted, and Society released from the fetters of superstition and the trammels of ignorance, ever since the revival of letters.

The first requisite of success in any institution is a staff of eminent teachers, each of whom gives freely the best of which he is capable. The best varies with the individual; one may be an admirable lecturer or teacher; another a profound

thinker; a third a keen investigator; another a skilful experimenter; the next a man of great acquisitions; one may excel by his industry, another by his enthusiasm, another by his learning, another by his genius; but every member of a faculty should be distinguished by some uncommon attainments and by some special aptitudes, while the faculty as a whole should be united and coöperative. Each professor, according to his subject and his talents, should have his own best mode of working, adjusted to and controlled by the exigencies of the institution with which he is associated.

It is fortunate for us, that although the number of professors is not large, they are men of very different antecedents, and of very different intellectual qualities, so that each in his way strengthens all the others. It is not without interest to the public, also, that in determining questions of policy and administration, there are those among us who are personally familiar with the methods of institutions quite diverse in character. Among the seven persons who have constituted the nucleus of the Faculty, are graduates of the Universities of Oxford, Cambridge, London, and Göttingen, of American colleges, of a medical school, and of a technological school. These same gentlemen have also been familiar as teachers and examiners with a still greater variety of institutions, and in all

their discussions this diversity of experience proves most advantageous. The staff of Associates, Lecturers and Fellows includes the representatives of a still wider circle of literary institutions.

For an exposition of the views which are held by the professors in the development of their departments, according to the principles now laid down, reference may be made to an address by Professor Sylvester (Feb. 22, 1876) on Mathematical Studies and University Life; to an article by Professor Gildersleeve, entitled "Classics and Colleges," in the *Princeton Review* for July, 1878; to an introductory discourse by Professor Martin on the study of Biology, printed in the *Popular Science Monthly*, for January, 1877; to some remarks on the study of Chemistry, by Professor Remsen, in the *Popular Science Monthly*, for April, 1877, and to a review of the laboratory work here inaugurated, which was presented at the commemoration exercises of 1878, by Professor Remsen, and is printed in part on a subsequent page of this report. There are also numerous reports, circulars and programmes published by the University of which a list is appended.

The second requisite of a university is a corps of well qualified students. The nucleus of such a body was secured from the first by a system of fellowships which brought to Baltimore twenty specialists, already graduated elsewhere, and ready

to continue among us their higher studies, sometimes with reference to a degree and sometimes with reference to professorships, or other literary and scientific careers. The condition on which these fellowships were bestowed was very simple; but in consequence of the large number of applicants, not only at the time of the original appointment, but whenever vacancies have occurred, the selection has been attended with great difficulty. As a result of the care which the Faculty have exercised in this respect, it may be mentioned that several of the holders of these fellowships have been invited to become instructors in other institutions of acknowledged character, and several have been promoted to the rank of Assistant Professor or Associate among us. Many of the Fellows have proffered courses of instruction or lectures, with the approval of the Faculty: Mr. Means on the Eastern Question, Mr. Royce on German Literature, Mr. H. C. Adams on Political Economy, Mr. Halsted on Modern Logic, Mr. Sihler in Greek, etc. Possibly in the future still greater prominence will be given to such courses, and thus the fellowship system will become a sort of training school for young professors. A list is given in the Appendix of all who have been appointed Fellows.

Around this nucleus of the Fellows were soon gathered other graduates, twenty being enrolled in

the first year, thirty-eight in the second. They bore diplomas from many American colleges, and from several foreign institutions. Among the number were some who had commenced the practice of law or medicine, several clergymen, and several who had held responsible places as teachers. All such students were made welcome, —but in order that no false impression might be given at a distance, those who were enrolled as candidates for the degree of Doctor of Philosophy, or who were giving all their time to study, without reference to a degree, were designated as "Members of the University" and became entitled to some slight distinctive privileges. Twenty such in addition to the twenty Fellows were so designated in the winter of 1877–78.

It is believed that as the plans of this institution become known, many young men who have graduated in colleges, will desire to come to Baltimore for one or more years of graduate study, with or without regard, as the case may be, to the attainment of a second academic degree. In the library, the laboratories, the scientific associations and the lecture rooms, but especially in access to the private instructions and counsels of the professors, such students will find abundant opportunities for continuing their education.

METHODS OF INSTRUCTION.—The methods of instruction have varied with the preference of the

teachers and with the requirements of the subject. In certain branches of mathematics, in chemistry, physics, biology, etc., courses of lectures extending through the entire year have been given; the laboratories have been opened under competent direction six days in the week; in languages and literature a great variety of classes have been formed. The students have not been distributed into seniors, juniors, etc., or into first, second and third year classes; but each one has been assigned to a member of the Faculty who has acted as his official Adviser, and has assisted him in determining the order of his studies,—so that amid the manifold opportunities which are here afforded the scholar may not be bewildered. A careful record of the examinations is preserved and no one will be permitted to prosecute his studies, unless he satisfies the tests of talent and industry established by the Faculty.

The character of the work which has been in progress in the laboratories was set forth in an address by Professor Remsen in the following terms: (Feb. 22, 1878.)

I have been asked to make some statements in regard to the activity of the three scientific laboratories which form a part of our University, and I undertake the task with pleasure. The theme is a more fruitful one than a year ago most of us anticipated. The three laboratories already have records which speak for themselves. I shall endeavor to call attention in as few words as possible, particularly to such original investigations as have either already been completed or are now in progress. It is believed that we can thus get a fairer picture and truer measure of the best form of activity than by any other method.

The work in the biological laboratory has diverged along the two main lines of biological science, the study of structure and development or morphology, and the study of function or physiology. Under the direction of the professor, one student has been engaged for the past twelve months in the study of the structure of the glands of the stomach, with the view of endeavoring to decide what part each of the two kinds of cells lining them plays in the formation of the digestive secretion. With this has been combined a study of the digestive power of the stomach under different conditions and the study of the development of its glands in the embryo.

Another investigation which is going on is one into the changes in the spinal cord which follow cutting of certain nerve roots, with the view of tracing upwards particular fibres in the spinal cord on their course to the brain.

Another very interesting investigation in progress in the laboratory is a study of the life history of certain microscopic fungi which cause some skin diseases. In the skin these occur in only one stage of their life history, but by planting spores, taken from the skin, in different artificial nutrient fluids, it has been possible to follow out at least one previously unknown stage; and by further cultures, under different conditions, it is hoped to follow the whole life history of the plant. The importance of this, with reference to the origin and spread of these diseases does not need pointing out.

A series of investigations on the activity of the nervous factors in the respiratory mechanism of the frog, is also in progress, which, it is hoped, will throw some light upon the nature and mode of action of the respiratory centre in other animals, a physiological question which is, at present, in a very unsatisfactory state. With this matter is, moreover, involved a point of the highest importance in the physiology of the nerve centres: the question, namely, whether some of them can start nervous stimuli without being aroused to activity by some external influence acting upon the body, or whether, in all such cases, the nervous discharge is really excited, though perhaps in a roundabout way, by external changes. In other words, whether some nerve centres are really *automatic*, or whether all apparently automatic actions are not really disguised *reflex actions*.

On the morphological side, one of the Fellows has been employed for the past year in studying the development of the bony fishes, especially the *Salmonidæ*. During the past summer he traced the external changes of form undergone by the developing shad and smelt; and he has just published a series of illustrated papers upon these fishes, in the annual report of the Maryland Fish Commission for 1878. His published papers upon this subject are introductory to the more important and exhaustive results which he expects to reach by the study of his preparations.

Another Fellow is employed in the study of the embryology and adult structure of the Salamander. He has traced the external changes very completely, and has made a great number of sketches, as well as forty careful drawings, showing the external form of the animal at all stages of development. He has also made about six hundred microscopic sections of eggs and embryos, which he is now studying. The method of studying the growth of an animal by making transparent sections of hardened embryos, has been almost entirely neglected by American observers, who have generally been content to rest satisfied with mere superficial examination. The application of this improved method of research to American forms of life may be expected to yield important results.

Finally, a wide research is being carried on by the Associate as to the development of the *Mollusca* in its bearing upon the phylogeny of the group, and upon the Gastrula theory of Hæckel. The developmental history of a number of forms has been traced, and two illustrated papers are now in press, and another in preparation.

In the Physical department the Professor has decided a question of fundamental importance in connection with the theory of electricity. He has proved that, when electricity is carried along through space, magnetic action is produced, and that the amount of magnetic action is the same whether the electricity is carried along through space or conducted in a wire. It is believed that this fact will prove the existence of an electrical fluid.

The Professor has also made a new determination of the value of the absolute unit of electrical resistance. This value, which is of great importance in researches in electricity, had been determined by many others, the result most commonly accepted being that obtained by a committee of the British Association. Modern results differ from one another as much as four per cent. The discrepancies between the many results on record have led the Royal Society of England to appropriate a considerable sum for the purpose of making a new determination. The result obtained here last year differs only eight-tenths of one per cent., from that of the British Association.

Another investigation, the experimental part of which was carried out by a Fellow in the department of Physics, had for its object the determination of the diamagnetic constants of certain substances, but it is difficult to state in an intelligible way to a non-professional audience the object of these experiments.

At present the Professor of Physics is engaged in determining the mechanical equivalent of heat. When some years ago, it was shown that heat is only a peculiar kind of motion, and that ordinary perceptible motion can be converted into heat, and the heat reconverted into perceptible motion, attempts were made to determine exactly how much heat is equivalent to a certain definite amount of work. The work performed in any given case is measured by the weight of the body moved and the distance through which it is moved. Thus, if a body

weighing one pound is lifted through one foot, work equal to one foot-pound is performed. If moved through two feet, or if the body weighs two pounds and is moved through one foot, two foot-pounds of work are performed. So, also, if a body weighing a pound be allowed to fall through one foot, a foot-pound of work will be accomplished. If a body thus falling be suddenly and perfectly stopped the perceptible motion is converted into heat. Now for a certain amount of work which thus disappears a certain quantity of heat makes its appearance.

Joule, in England, first attempted, by direct experiments, to establish the relation between work and heat, and by ingenious methods obtained results which have since been used extensively. Other observers have obtained results differing from those of Joule.

The elaborate experiments which are now going on here, although not yet completed, have already shown that Joule's result, obtained years ago, is probably more accurate than any of those obtained since. The apparatus employed in these experiments was designed and made here. It is very ingenious, and a study of it will show that it is certainly capable of giving results of great accuracy. It is run by a steam engine, and kept going for a length of time continuously, so that a great many results are obtained in every series of observations. The experiments are performed partly under the auspices of the American Academy of Arts and Sciences in Boston.

The Associate in Physics has been engaged in working out a theory of a lens to be used in astronomical telescopes. The chief difficulty in these lenses at present is the color produced by them called the secondary spectrum. By using three kinds of glass, and combining them according to the principles of a definite theory, this great difficulty can be overcome. A telescope is to be constructed involving the use of the new object-glass.

In the Chemical Laboratory, work has been going on only since February, 1877, and the building was not completed until the beginning of the present academic year. I shall endeavor to give you a faint idea of the tendency of the higher work which has been done. A large number of the compounds of carbon are classed collectively under the head "Aromatic Bodies." They possess marked peculiarities which distinguish them clearly from other compounds. They present many interesting phenomena which have attracted the attention of a large number of chemists, particularly during the past ten or a dozen years. One peculiar fact in regard to them is this, that they yield three well characterized series of derivatives of precisely the same composition. A theory has been proposed to account for this fact, and the theory has been pretty generally accepted.

Two of the Fellows, together with the Associate in Chemistry, have been engaged during the past year in studying with me some members of these three series for the purpose, if possible, of establishing fundamental differences in properties between them. Up to the present other

investigators have determined to which series an unknown compound belonged solely by converting it into a known compound. The effort has been made in some of the investigations which are in progress in the chemical laboratory to determine the series of a compound by studying the substance itself in such a way as to reveal properties characteristic of the members of one or the other series. In other words, we are working entirely independently of the theory. Certain results have already been reached which promise a definite solution of the problem before us. Some of these results have been published in brief in this country under the head of "Notes from the Chemical Laboratory," and in the journal of the German Chemical Society. It appears from a notice in the last number of this journal that some of the conclusions reached by us by our method of inquiry do not harmonize with conclusions drawn by the usual method; and it is believed that the efforts necessary to show the cause of the discrepancy must lead to a clearer conception of the questions under discussion than we have at present.

Another investigation by a Fellow has an object akin to that of the more extended one just referred to. In this case, also, definite results have been reached; and these will form the subject of a dissertation to be presented to the Faculty of this University by the gentleman, through whose labors they have been accomplished, as a candidate for the degree of Doctor of Philosophy.

Further, a student has been engaged independently in perfecting a simplified and convenient method for the analysis of gases. He has devised a complex form of apparatus, which promises to be of value.

These statements will serve to give you some idea of the character of the higher work going on within our walls, at least in the three scientific laboratories. Those statements which have been made concerning the work in other departments will indicate that activity is not displayed in but one direction. I do not think there is any evidence in this institution to develop in one direction in such a way as to check development in other directions; and I shall be sorry if the day ever comes when it can be said that here science is fostered and other subjects neglected, or that other subjects are specially fostered and the sciences neglected. I know there is no desire on the part of our authorities to encourage any one subject or set of subjects in such a way as to interfere with others. The antagonism which here and there exists between the so-called classical and scientific training does not exist among us. But an error which is too frequently fallen into is here avoided. Students are not admitted to a course of scientific studies on easier terms than those who desire a classical course, and, after being admitted, as much is required of one class as of the other. If these principles are strictly adhered to—and there is no reason to believe that they will not be—there will be less cause for the now somewhat justified belief that the scientific student is not as well trained as the graduate of the college proper. The right of this method of dealing with the matter is so apparent as to require no justification.

An important element in our intellectual activity has been the opportunity of frequent and informal meetings in which professors and scholars have taken part. During the first year, social gatherings (attended by trustees, professors, instructors and advanced scholars) were held monthly in Hopkins Hall and the Library. At each of these gatherings some subject was brought forward and treated in a way to interest all who were present,—for example, the excavations at Olympia, by an eye witness; the Bayreuth festival, by an auditor; the U. S. Fish Commission, by a collaborator; the Biological Laboratory, by the Biologists; the Peabody Institute, by the Provost, etc. These informal assemblies tended to promote a friendly acquaintance among those who were brought together for the first time from distant places; but in the second year, there was a call for more special gatherings, —having a scientific, rather than an entertaining character.

Accordingly four associations have been organized:

1. A General Scientific Association.
2. A Philological Association.
3. An Historical Association.
4. A Mathematical Conference.

These associations are attended by the Professors, Associates, Fellows and Graduate Students in the several departments.

In forming plans, we have constantly remembered, as already stated, that it has been important to provide for the youth of Baltimore, (and for such others as might desire the same advantages), ordinary college instruction intermediate between the City College and the private school on the one hand, and the university courses on the other. We have been fortunate in securing for the college part of our work, gentlemen who are acknowledged to be of uncommon ability as classical and mathematical teachers, and we can now truly say that the youth of Baltimore have opened to them a well considered system of instruction from the primary school to the university, so that it is not necessary for them to go to a distance from their homes in order to obtain a liberal and thorough education either in science or literature.

There are some peculiar arrangements in our college work which are regarded as advantageous. The large number of teachers in proportion to the scholars gives to the latter the advantage of close personal observation and guidance. The abandonment of the traditional class system, enables those who are favored by the possession of uncommon talent, or health, or early advantages, to push forward in their studies as rapidly as they choose; and it enables those whose early training has not been so good, or whose health gives out, or who need to spend a part of their time in the acqui-

sition of a support, to prolong their course over a longer period than is usual. The permission of eclectic courses enables us to give simultaneously, to different sets of pupils, the traditional college training in classical studies or the fundamental studies of the modern scientific schools. At the same time there is no marked subdivision between those who follow the old paths and those who choose the new. The same standard of matriculation is established, the same firmness and persistence of application are expected, the same severity of examinations is maintained for all sorts of students, and care will be taken that every one who receives the Baccalaureate degree shall be liberally trained in language, mathematics and some branch of science, the proportions of different studies being left to the choice of the student under the regulations of the Faculty.

Seven combinations of collegiate study are suggested in the Programme, either of which will lead to a Baccalaureate degree. These courses are as follows:

(1.) *For one who wishes a good Classical training:*
Marked proficiency in Greek and Latin.
in addition—Modern Languages, Philosophy, and any one scientific subject.

(2.) *For one who looks towards a course in Medicine:*
Marked proficiency in Biology, and either Chemistry or Physics.
in addition—Either Chemistry or Physics, Modern Languages and Philosophy.

(3.) *For one who prefers Mathematical studies,* with reference to *Engineering, Astronomy, Teaching, &c.:*
Marked proficiency in Mathematics and Physics.
in addition—Modern Languages, Philosophy and Chemistry.

(4.) *For one who wishes an education in Scientific studies, not having chosen his specialty:*
Marked proficiency in Mathematics, and one of the following subjects: Chemistry, Physics, or Biology.
in addition—Modern Languages, Philosophy, etc.

(5.) *For one who expects to pursue a course in Theology:*
Marked proficiency in Greek and Hebrew.
in addition—Philosophy, and two scientific subjects.

(6.) *For one who proposes to study Law:*
The same as No. 1, with the substitution of Philosophy and History for Greek, and two (instead of one) scientific subjects.

(7.) *For one who wishes a Literary training not rigidly Classical:*
Marked proficiency in Modern Languages and Philosophy.
in addition—Latin, and two other subjects.

It may perhaps be of service to give, by one or two concrete instances, illustrations of the way in which this system of collegiate instruction actually works.

A. B. came to this University in January, 1877. He was backward in Latin, and only a beginner in Greek. But as it was apparent that he was a person of intelligence and earnestness he was admitted as a candidate for matriculation. He was allowed to join classes which were in attainment considerably in advance of himself; but he soon made himself at least the equal of his associates in recitation; and passed examinations in June, 1877, so satisfactorily that he was then entered in the register of matriculates.

It then became his duty, with the counsel of his adviser, to select a course of study, the satisfactory completion of which would entitle him to the Baccalaureate degree. He chose Latin and Greek as his major subjects; and for his minor subjects, History, Modern Languages and Biology.

In Greek he selected: Homer Il., I–XII; Euripides, three plays; Aristophanes, three plays; Demosthenes, the *de Corona* and two other speeches; Plato, Protagoras; and Thucydides, lib. I–IV.

In Latin he selected: Virgil, Georgics and Æneid, IV–IX; Plautus, one play; Terence, one play; Tacitus, Annals, I–VI; Cicero, select letters and three speeches; Horace, Odes, Epodes and Satires.

In making such a selection of particular books it is always understood that substitutions may be made subsequently, if any reason for it is alleged satisfactory to the student's adviser.

During the year just passed this student has passed an excellent examination, as certified, in every case but one, by an independent examiner in addition to the class instructor, in *Euripides*, Iph. Taur.; *Aristophanes*, Nubes; *Demosthenes*, in Phorm. and in Call.; *Plato*, Protagoras; *Plautus*, Captivi; *Terence*, Phormio; *Cicero*, pro Cluentio, and select Letters. He has besides completed his minor course in History. In this case all of the Latin and Greek were read in class with an instructor.

Another instance of a somewhat different character may be mentioned.

C. D. entered the University in October, 1877 with an excellent preparation. It is not necessary to mention the scheme of studies he selected; but during the year he has disposed satisfactorily, in all cases, with the double examination spoken of above, of the following parts of his work: *Tacitus*, Hist. I; *Plato*, Apology and Crito; *Thucydides*, lib. I; *Horace*, Satires and Ars Poetica; *Plato*, Protagoras. These books were read in class with an instructor. Besides this he offered the following books as the object of his private study, and passed in them satisfactorily under similar tests: *Horace*, Odes and Epodes; *Tacitus*, Hist. II–V, with Germ. and Agric.; and also finished the minor course in French and German.

In classical studies, care is taken by the instructors to vary from year to year the authors and books they select as the basis of their recitations so that a student who passes two or three years here will have the advantage of class-instruction in a considerable range of writings. But, as may be seen in the second of the cases above described, a student may extend his reading beyond and outside the work of the class-room, and may avail himself of whatever advantages he possesses, either of previous training, or health, or aptitude for study, to press on rapidly in the fulfilment of the work antecedent to his degree; as he knows that the University will give him credit for this private

work, no less than for that done under the eye of instructors, if it satisfies the exactions of the examiners in regard to breadth and accuracy.

The standard of matriculation has been purposely made higher than is usual, for the sake of encouraging young men who may propose coming to Baltimore to secure in advance, near to their own homes, as good a preparation as they can in fundamental studies. The plans of St. Johns College, in Annapolis, are now so arranged that young men at the close of the sophomore year may pass our matriculation examination. The addition of a fifth year to the course of the City College is likely to be of great advantage to the large numbers of young men who look to it for their early intellectual training, antecedent to university life.

PUBLIC AFTERNOON LECTURES.—A part of the University lectures have been open to the educated citizens of Baltimore, under simple regulations, since the beginning of the University. Some of these courses have been given by the resident professors, associates and fellows; but most have been delivered by gentlemen from a distance who are acknowledged authorities as teachers or investigators in the subjects they have treated.

The audience on these occasions has varied in numbers from an average of a dozen hearers in a course of twenty lectures, to an average of two

hundred in a course of the same length; but the number of attendants gives no indication of the value of the course. Some of the subjects discussed, particularly literary themes, are interesting to many persons, while others having a decidedly technical or professional character, are only attractive to special students. Indeed, the direct effort has been made to secure such lecturers and to introduce such themes as would interest different classes of hearers. A scrutiny of the registered names of attendants shows that among them there have always been (1) the members of the University interested in the subject presented, (2) teachers from the public and private schools, (3) professional students,—of law, medicine, chemistry, etc., and (4) other educated persons, ladies and gentlemen, who came from various motives.

The University has derived much advantage from the maintainance of these lectures. Subjects not treated by the resident professors, have been discussed, in a masterly way, by some of the most eminent scholars in this country. Three of the courses have already formed the basis of printed volumes; on Astronomy by Professor Newcomb, on Money by Professor Walker, and on Torts by Professor Cooley. It was once suggested that the publication of the lectures should be required; but the proposition was never formally adopted. These non-resident lecturers during their stay in Balti-

more have given private guidance and instruction to those who have sought it from them,—in some cases organizing small classes for conference and discussion on special themes.

As an illustration of the work of these conferences, the following statement is given:

The class in Constitutional Law met twice a week during the stay of Judge Cooley in Baltimore. There were ten persons connected with the class, some of whom were Fellows of the Johns Hopkins University and others, young lawyers from the city. The special subject of inquiry and discussion was the theory of the American constitution. This subject had been suggested by some of the Fellows who had already studied historically the forma ion of our system of government and who were therefore desirous of supplementing their course by obtaining some instruction in the principles of American constitutional law. Judge Cooley kindly consented to give us his views concerning the theory of the constitution, but disclaimed any adherence to partisan schools of interpretation. He conducted the class in an informal way, he himself reading and expounding the most important articles of the constitution, but encouraging discussion and eliciting the views of the class by the method of question and answer. Decisions by the Supreme Court, which served to determine the extent of congressional powers as distinguished from the powers retained by the States, were often cited by Judge Cooley and the cases themselves were usually explained. So far as practicable, moreover, a comparison was instituted between the principles of our government and those of the English system. The constitutional problems of our own day were also freely discussed.

The entire course closely resembled the methods of instruction which are pursued in the so-called *Seminarien* at the German Universities. The professor guides and instructs the class in a familiar way; topics are discussed informally; students ask questions of the professor and the latter expounds; the professor asks questions of the students and views are compared. In Heidelberg, Dr. Bluntschli used to take the Prussian constitution as the basis of discussion in his private class of eight or ten men. He would first compare each article with its prototype in the Belgian constitution and then proceed to a comparative view of similar features of public law as seen in France, England, and the United States.

Much interest was manifested by Judge Cooley's class in the comparative method of studying the American and English systems of government, and it is generally hoped that this subject may be resumed.

The Lecturers, as they have been called upon, have also favored the University with their counsel and suggestions in respect to the development of our plans, and in many other ways have quickened the intellectual life of this community. But, perhaps, the greatest advantage of all has been the interest thus awakened here among cultivated persons, in this new foundation. By no other method could the attention and approbation of our own citizens be so quickly secured as by inviting them to our halls and encouraging them to become acquainted with the methods and principles on which we rely. A city of 300,000 inhabitants is quite large enough by itself to send up every year to the University, full classes of bright and aspiring young men, and they are most likely to be incited to an intellectual life by the glimpses they get of it, and the reports they hear from it, as month by month, one great subject after another, is publicly expounded by some learned lecturer.

It is quite possible that as the resident staff of the University increases in numbers, there will be less reason than there has been for the engagement of gentlemen from other colleges; and there are indications that the Peabody Institute will resume its class instruction on such a plan,—perhaps with the coöperation of the University,—as to relieve us from this part of our work; but such questions as these do not require immediate decision.

Every encouragement has been given to the teachers of the University to publish freely. A list of the various books and papers printed by the resident members of the University during the last two years, under their own names, includes over one hundred titles; among them are many important communications to the scientific journals of this country and of Europe.

Under the auspices of the University, the "American Journal of Mathematics, Pure and Applied," has been instituted by Professor Sylvester, with the coöperation of Dr. Story and Professor Rowland of Baltimore, Professor Peirce of Harvard and Professor Newcomb of Washington. The Journal appears in large quarto form, whenever sufficient material is presented.

The researches made in the Chemical Laboratory under the direction of Professor Remsen, and his associate Dr. Morse, are published in occasional bulletins. Three numbers, including 68 octavo pages have already appeared.

Communications from the Biological Laboratory have been sent to the Journal of Physiology, published in Cambridge, England, under the editorial care of Professor Michael Foster; Dr. Martin being one of the associate editors.

Philological papers have been submitted to the American Philological Association, and to the American Oriental Society, by Professor Gildersleeve, Dr. Lanman, and others.

RELATIONS WITH OTHER INSTITUTIONS.—As the youngest of many organizations already in progress, the Johns Hopkins University may naturally hesitate to be forward in the proffer of coöperation with others, but it ought never to be backward in meeting with open and outstretched hand all overtures from its elders. The schools of law and medicine, maintained in Baltimore for many years past, (and never, perhaps, with more efficiency than now,) are so well attended as to make it quite superfluous for us to offer what they already provide. The City College is one of our chief allies among the preparatory schools, and has sent us many of our very best scholars. The Academy of Sciences is building up a Museum of Natural History, especially of the fauna and flora of Maryland, and ought to be so liberally endowed as to become the Museum of the city and the University. In the well furnished library of the Maryland Historical Society, the advanced students in American history have had rare facilities for their researches most generously bestowed. The Mercantile Library, in its way, has also been freely accessible,—and with other local organizations our relations have been of the most friendly sort. The Athenæum has extended to us social courtesies in a liberal spirit. The newspaper Press in Baltimore has also been of great service in freely communicating to the public the announcements of the

University, and the reports of its public celebrations and addresses.

But there is one foundation, the Peabody Institute, upon which we depend, one may almost say, for intellectual sustenance. Its large and well chosen library, its important series of scientific journals and transactions, purchased with reference to the wants of scholars, and its funds for the constant increase of these collections, relieve the University from the necessity of establishing a general library upon a liberal scale. In a previous report the letters exchanged by the Peabody and Hopkins Trustees have been printed, and during the past year there have been repeated conferences between the authorities of both foundations looking toward their mutual coöperation in the advancement of learning, especially in respect to the use of the library and the maintenance of class lectures. The recent completion of a large addition to the Peabody building to which the Library and Reading-room are transferred, and in which two new lecture-rooms are provided, has led to the hope that greater facilities than have hitherto been possible will now be given to scholars in the use of the library. The proposal has also been made that from time to time courses of public lectures shall be delivered by the teachers of the University before such classes as may be formed by the Peabody Institute. Incidental advantages also come

to the University from the Peabody departments of Music and the Fine Arts. There is every reason to rejoice that these foundations can be made so coöperative in promoting the good of the community. Each adds to the other's efficiency.

If Mr. Peabody had known that his example would be followed by Mr. Hopkins, or if the latter had purposed to render the foundation of the former most complete, their wishes could hardly be better expressed than they are, in order that each corporation may have its distinct sphere, its special guardians and managers, and its own independent responsibilities, and yet may be helpful to and aided by the work of the other. This union so far as the Library is concerned, is an affair of the heart itself,—for here the two institutions must inevitably unite or divide, be supporters or rivals. The life of a university depends upon books. There is no such thing as a strong university apart from a great library. Nor is it enough that books shall be collected and stored away for the generations to come. They must be readily accessible to those who can use them. It is a cause of constant congratulation to the teachers of the University, that the authorities of the Peabody Institute have built up so good a library, and that now by means of the new arrangements, there is reason to anticipate facilities in the consultation of books quite as free as are accorded in corres-

ponding libraries at home and abroad. If this hope is realized the power of the University will be greatly augmented and the obligations of scholars resident in Baltimore will be due in an almost equal degree to Peabody and Hopkins.

INSTRUCTION TO TEACHERS IN PHYSIOLOGY.—Influenced by a desire to awaken among School Teachers an interest in the study of Nature, and to give to them an opportunity for seeing something of the methods of modern scientific researches, Professor Martin offered to form in the Autumn of 1877, a Teacher's Class for Instruction in Physiology. It was strictly limited to school teachers or students of a normal college, who were engaged in teaching Physiology, or who purposed to teach it. Only sixteen students were received.

The class met for twenty weeks in Hopkins Hall on Saturday mornings at 10 A. M., commencing on Saturday, October 13. After a lecture the students adjourned to the Biological Laboratory for practical instruction, which continued until 2 P. M. It was announced that absence from any lesson, unless for a cause which the authorities of the University might deem satisfactory, would be treated as a resignation and the absentee's place filled up forthwith.

Microscopes and other instruments and the necessary material were provided by the University.

A statement of the results of this experiment is given in the following letter of Dr. Martin:

MARCH *18th, 1878.*

To the President of the Johns Hopkins University.

DEAR SIR: The class for the Instruction in Physiology of School Teachers finished its prescribed course of twenty lessons on Saturday last. It started with sixteen students, and experience of the first lesson or two having shown that a greater number could not be satisfactorily accommodated, subsequent applications for admission, which would have filled up the class to the number of eighteen, originally contemplated, were refused. Of the sixteen students, one left Baltimore at Christmas; all the rest remained with the class until the end of the course. The names of the class are as follows:

Miss Cowman,	Miss Bailey,	G. L. Smith,
Miss Pusey,	Miss Blackburn,	E. G. Gover,
Miss Richmond,	Miss Yarnall,	S. T. Moreland,
Miss Smyth,	Miss Nunn,	J. L. Tomlinson,
Miss Hampson,	Miss Bauman,	W. J. Cross.
Miss Warner,		

The strict rule enforcing attendance under the penalty of the removal of the absentee's name from the list of members of the class, worked very well, and I think caused no dissatisfaction. As the labor of getting the material ready for each Saturday's work was always considerable and often very great, all must have recognized it as fair that places should not be held by those who remained away for trivial causes. I am not sure, however, that I am not doing the members of the class an injustice in supposing that any such rule was necessary; several times I have been informed that some of the students had got up from a sick bed to attend the class, and have returned to it immediately afterwards; and one student, for several weeks, came regularly from Philadelphia every Saturday morning simply in order not to miss the lesson. Only six cases of absence occurred throughout, and all were satisfactorily accounted for.

The way in which the students worked was very gratifying to me. Almost without exception, they took a thorough interest in what they had to do, and in that way lightened my task to an extent for which I cannot but feel grateful to them. It is not too much to say that a spirit of earnestness characterized the class, and a desire to facilitate the work of Mr. Sewall and myself.

Some few students had, however, less knowledge of Physiology than was desirable in order to fully benefit by the Course; which, as stated in the preliminary announcement, was designed for those teaching, or pre-

paring to teach Physiology, and who might, therefore, be expected to have a fair elementary acquaintance with it, at least so far as book knowledge was concerned. In the case of similar classes being formed in the future, it would, I think, be desirable to try to select only those who already know something of the subject to be taught. The object of such courses is not to teach beginners, but to give good teachers an opportunity of acquiring a practical knowledge of their subject, which it might be otherwise difficult for them to obtain, and to put them in the way of demonstrating various simple facts to their pupils.

You will remember, that at my request, the Trustees offered to present a microscope to the student whose work in the Laboratory and whose notes on that work were the best. This was desirable on the first organization of such a course as a stimulus, until the students had got used to the method of teaching adopted, had learnt the value of making drawings of the objects which they saw and of other details insisted upon, which at first were probably irksome and appeared useless to many. Whether it would be desirable again to offer a similar prize is, I think, doubtful. If this class has been really successful and has been found valuable by those attending it, which the future must shew, applicants to join a similar class hereafter should require no such incentive, which except under exceptional circumstances is, I think, bad in principle, for teachers ought to require no extra inducement to make use of an opportunity to learn.

To arrive at a decision as to who was entitled to this microscope has given me some trouble, for the work of about half a dozen members of the class was very nearly equally excellent. On the whole I believe the best work was done by Mr. S. T. Moreland, but that of Miss E. Cowman was very nearly as good.

I beg leave therefore to recommend that the microscope (which I purchased for this purpose in London during the summer) be presented to Mr. S. T. Moreland.

Yours very truly,
H. NEWELL MARTIN.

Another kindred experiment was made in the long vacation of 1878, by Dr. W. K. Brooks, Assistant Professor of Comparative Anatomy, who organized a company of scientific students for the study of marine zoölogy at the mouth of the Chesapeake Bay. An account of this undertaking is given in the Appendix.

suggested as a desirable plan for introduction among us; but before arriving at a conclusion, the authorities have preferred to mature their plans for the promotion of resident students only.

The examination for this degree is threefold. In every case the candidate presents an elaborate thesis, on a topic approved by his chief adviser in the Faculty. The preparation of this thesis requires labor for the greater part of an academic year, and the completed paper is supposed to show the candidate's mastery of his subject, his powers of independent thought as well as of careful research, and his ability to express, in a clear and systematic order, and in appropriate language, the results of his study.

Every thesis is submitted by the Faculty to one of their own number, or to some other competent examiner who certifies whether or not, in his opinion, it is sufficiently good to be accepted. In case of its approval, the personal examination of the candidate goes forward, and this varies in form at the convenience of the examiner and in accordance with the requirements of the subject. As a part of the examination, the candidate appears before the professors collectively, or before some of their number, and submits to an oral questioning; at another time prepared questions are set before him for careful answers in writing.

An acquaintance with Latin, French and German, so far at least that writings in these languages may be easily read, is in all cases expected.

Evidence of acquaintance with the methods of modern scientific research, in at least one branch of science, is also expected in the case of those whose principal studies are in such departments as language, history, philosophy, etc.

In subjects admitting of exercises with instruments or of the scrutiny of specimens, the examiners are free to appoint special methods for determining the skill of the candidates.

In addition to the resident professors, scholars of distinction are from time to time invited to participate in the examinations, and examine the theses of the candidates. The object of this provision is to secure an estimate of the work of the candidates from those who are not responsible for their daily progress.

The following statement gives the names of the graduates of 1878, and the methods of their examination:

1. HENRY C. ADAMS, of Iowa, a Bachelor and a Master of Arts in Iowa College, presented a thesis on the "*History of Taxation in the United States*," which was examined by Professor Walker of Yale College. The candidate's principal examination was in Political Economy, and was conducted in the presence of the Faculty, by Prof. Walker. The subsidiary examination was in American History. The questions in this

subject, which were answered in writing, were proposed by Mr. George Bancroft of Washington; the oral examination was conducted by Dr. Scott.

2. THOMAS CRAIG, of Pennsylvania, who had received the degree of Civil Engineer from Lafayette College, presented a thesis on "*The Representation of one Surface upon another; and on some points in the Theory of the Curvature of Surfaces.*" His examination in Mathematics, his main subject, was upon papers prepared by Professor Sylvester, Professor Newcomb and Dr. Story. His examination in Physics was conducted by Professor Rowland, in the presence of Professor Mallet of the University of Virginia, and the resident Professors.

3. JOSIAH ROYCE, of California, a Bachelor of Arts of the University of California, presented a thesis on the "*Interdependence of the Principles of Human Knowledge,*" which was referred to President Porter of Yale College.

His main subject was the History of Philosophy, ancient and modern, upon which he was examined by Professor G. S. Morris, of the University of Michigan, by written questions. His subsidiary examination was on the history of German literature of the eighteenth and nineteenth centuries, which was conducted by Assistant Professor Brandt, partly in the presence of the Faculty.

4. ERNEST G. SIHLER, of Indiana, who completed the classical course of a German gymnasium, the Concordia College in Indiana, presented a thesis on "*Plato's use of Metaphor and Comparison,*" which was referred to Professor Gildersleeve.

The chief examination of the candidate was in Greek History and Literature, and was conducted by Professor Gildersleeve and Professor C. D. Morris. The secondary examination was in Ancient Philosophy, and was conducted orally by Professor G. S. Morris, of the University of Michigan, in the presence of the Faculty.

COMMEMORATION DAY.—The twenty-second of February, commonly observed as a legal holiday in honor of Washington's birth-day, has been adopted by the University as its Commemoration Day. In 1876, the work of the University was formally inaugurated. In 1877, addresses were delivered by the Professor of Mathematics, Mr. Sylvester, and the Professor of Greek, Mr. Gildersleeve, and a poem was read by Professor James

Russell Lowell. In 1878, addresses were made by the Professor of Chemistry, Dr. Remsen, by one of the Trustees, Hon. G. W. Brown, and by President Eliot of Harvard University. These addresses with the remarks of the President of the University were printed with more or less completeness in the newspapers of the day.

THE LIBRARY.—From the report of the Librarian, Mr. Arthur W. Tyler, June 1st, 1878, it appeared that there were 6,167 bound volumes on the shelves of the Library, besides several hundred unbound volumes, and pamphlets. The Library receives by subscription one hundred and sixty-six periodicals and by gift twenty-six.

Through the medium of the new-book department, under the voluntary direction of Mr. T. C. Murray, a large number of recent publications, European and American, have been brought to the University for examination, part of which have been retained by the University and part returned to the senders.

The Library has received many valuable gifts, a list of which is given in the Appendix. Among other noteworthy gifts not before acknowledged, should be mentioned a collection of twelve photographs, mounted and framed, representing the scenery of the Baltimore and Ohio Railroad, presented by John W. Garrett, Esq., one of the Trustees; an autograph of George Washington,

being his original plot of lands at the mouth of the Ohio and Kanhawa rivers, surveyed and offered for sale by him in 1773,—the gift of Reverdy Johnson, Esq.; lithographic portraits of Schelling and Schlosser, from the same donor; and a large photographic likeness of JOHNS HOPKINS, the founder of the University,—presented by Francis White, Esq., the Treasurer of the University.

PERSONAL.—Death has removed from the Board, one of the members originally designated by the Founder to act as a Trustee,—Mr. Thomas M. Smith, who died in Baltimore in August, 1877.

The following minute, adopted by the Board, expresses their appreciation of his character.

> The Trustees of the Johns Hopkins University express their sincere respect for the memory of THOMAS M. SMITH, their late associate, who died on the 14th day of last August.
>
> Mr. Smith was the life-long friend of the Founder of the University, and was well known and highly esteemed in this community as a good and patriotic citizen and as a successful merchant, distinguished for good judgment and probity.
>
> Although his failing health prevented his taking a prominent part in the affairs of the University, he performed the duties of a Trustee with broad and liberal views, and with conscientious fidelity.

The place thus made vacant was filled January 7th, 1878, by the election of Mr. Charles Morton Stewart.

The staff of Professors has not been increased within the past year. Nine of the Associates have been designated Assistant Professors,—namely, Messrs. Brandt, Brooks, Cross, Elliott, Hastings,

Morse, Murray, Lanman, and Story; and one of the Fellows, Herbert B. Adams, Ph. D. (Heidelberg) a graduate of Amherst College in 1872, has been made an Associate in History.

Thirty-five persons have held the appointment of Fellow, and those who have given up the post have gone forward, here or elsewhere, to stations of usefulness and honor. Several have received appointments in other colleges.

The number of Students, including the Fellows, entered here during the first two years is 159. On the register of the first year, 89 names were enrolled; of the second year, 104 names.

Summary.

	Fellows.	Other Graduates.	Matriculates.	Special.	Total.
1876–7, . . .	20	34	12	23	89
1877–8, . . .	20	38	24	22	104
1878–9,* . . .	20	35	25	35	115

This summary does not include the attendants upon the Physiological class, the Zoölogical Station and the afternoon courses of lectures publicly given in Hopkins Hall.

Sixteen persons were taught in the Teacher's class in Physiology, during the winter of 1877–8. Ten students worked in the Chesapeake Zoölogical Laboratory in the summer of 1878. The average attendance upon the Philological Association was 13; on the Historical Association 20; on the Scientific Association 25.

* At the opening of the third year. Several of the Students now enrolled as "Special" will soon be matriculates.

The average attendance upon the public afternoon lectures varied in the different courses from 20 to 195, as will be seen from the following statement.

Professor.	Subject.	No. of Lectures.	Average Attendance.
	1876-77.		
GILDERSLEEVE,	Greek Lyric Poetry,	20,	42
RABILLON,	French Literature,	19,	20
NEWCOMB,	History of Astronomy,	20,	50
CHILD,	Chaucer,	20,	191
LOWELL,	Dante,	20,	179
WHITNEY,	Comparative Philology,	18,	84
HILGARD,	Geodetic Surveys,	20,	21
WALKER,	Money,	20,	49
COOLEY,	Torts,	20,	87
MALLET,	Waste Chemical Products,	20,	29
	1877-78.		
REMSEN,	History of Chemistry,	12,	111
BILLINGS,	Medical Education,	20,	49
GILDERSLEEVE,	Homer's Odyssey,	20,	153
RABILLON,	French Literature,	20,	48
MORRIS,	History of Philosophy,	20,	124
CHILD,	Comparative Ballads,	20,	137
"	Shakspeare,	10,	195
COOLEY,	Constitutional Law,	6,	103
JAMES,	Psychology,	10,	62
ALLEN,	History of Fourteenth Century,	20,	96
WALKER,	Finance,	21,	44
MALLET,	History of Chemical Industry,	20,	45

CONCLUSION.—In concluding this report, I beg leave to congratulate the Trustees on the harmony which has attended all the counsels of the University during the critical period of organization. The plans here formed have been adapted to the wants of varied classes, and have been accepted by the public as wise and promising. The excel-

lence of the instruction here given has attracted scholars of mark from distant parts of the country, and has awakened among the youth of Baltimore a determination to profit by such advantages. It is a pleasure to add that not a single case of discipline has yet been brought before the Faculty. When a student has been found to be unable or unwilling to pursue his studies with success, he has quietly been advised to withdraw.

A voluntary religious service has been daily maintained since the opening of the University, with an increasing attendance both of teachers and scholars. The plan of assigning every student to an Adviser, who acts as his friendly counsellor, works well and gives to parents and scholars the assurance that every member of the University will have that personal guidance and help which he needs during his student life.

We have every reason to hope that, with the blessings of Providence, a strong University will, at no distant day, be developed from the germ now planted.

Respectfully submitted,

D. C. GILMAN.

BALTIMORE, *Sept. 1, 1878.*

APPENDIX.

A.

Academic Staff.

PRESIDENT.

Appointed.		
Dec. 30, 1874.	GILMAN, DANIEL C.	

PROFESSORS.

Jan. 3, 1876.	GILDERSLEEVE, BASIL L.,	*Greek.*
Mar. 5, 1876.	SYLVESTER, J. J.,	*Mathematics.*
Apl. 17, 1876.	REMSEN, IRA,	*Chemistry.*
Apl. 17, 1876.	ROWLAND, HENRY A.,	*Physics.*
Sept. 4, 1876.	MARTIN, H. NEWELL,	*Biology.*
Sept. 4, 1876.	MORRIS, CHARLES D.,	*Classics.*

ASSOCIATES.

April 3, 1876.	CROSS, JOHN M.,	*Classics.*	
April 3, 1876.	UHLER, PHILIP R.,	*Natural History.*	
April 17, 1876.	SCOTT, AUSTIN,	*History.*	
June 5, 1876.	ELLIOTT, A. MARSHALL,	*Modern Philology.*	
June 5, 1876.	MURRAY, THOMAS C.,	*Shemitic.*	
Sept. 4, 1876.	BRANDT, HERMAN C. G.,	*German.*	
Sept. 4, 1876.	BROOKS, WILLIAM K.,	*Biology.*	
Sept. 4, 1876.	MORSE, HARMON N.,	*Chemistry.*	
Sept. 4, 1876.	RIDGWAY, ROBERT,	*Natural History.*	1877.
Sept. 4, 1876	STORY, WILLIAM E.,	*Mathematics.*	
Sept. 4, 1876.	TYLER, ARTHUR W.,	*Library.*	1878.
Oct. 2, 1876.	HASTINGS, CHARLES S.,	*Physics.*	
May 7, 1877.	LANMAN, CHARLES R.,	*Sanskrit.*	
June 3, 1878.	ADAMS, HERBERT B.,	*History.*	

RESIDENT LECTURER.

June 5, 1876.	RABILLON, LEONCE,	*French.*

NON-RESIDENT LECTURERS.

Appointed.			Courses.
1876.	BILLINGS, JOHN S.,	*Medical History, etc.*	One.
1876.	CHILD, FRANCIS J.,	*Early English.*	Three.
1876.	COOLEY, THOMAS M,	*Law.*	Two.
1876.	HILGARD, JULIUS E.,	*Geodetic Surveys.*	One.
1876.	LOWELL, JAS. RUSSELL,	*Romance Literature.*	One.
1876.	MALLET, JOHN W.,	*Technological Chemistry.*	Two.
1876.	NEWCOMB, SIMON,	*Astronomy.*	One.
1876.	WALKER, FRANCIS A.,	*Political Economy,*	Two.
1876.	WHITNEY, WILLIAM D.,	*Comparative Philology.*	One.
1877.	ALLEN, WILLIAM F.,	*History.*	One.
1878.	JAMES, WILLIAM,	*Psychology.*	One.
1878.	MORRIS, GEORGE S.,	*Philosophy.*	Two.
1878.	DIMAN, JEREMIAH L.,	*History.*	One.
1878.	VON HOLST, H.,	*History.*	One.

FELLOWS.

Appointed.	Corrected to October, 1878.	Retired.
1876.	ADAMS, HENRY C., Ph. D., Student in the University of Heidelberg.	
1876.	ADAMS, HERBERT B., Ph. D., Associate in History; Lecturer in Smith College, Mass.	1878.
1876.	BROOKS, WILLIAM K., Ph. D., Assistant Professor of Comp. Anat.	1876.
1876.	CRAIG, THOMAS, Ph. D., Fellow in Physics.	
1876.	GORE, JOSHUA W., C. E., Professor in S. W. Baptist Univ., Jackson, Tenn.	1878.
1876.	HALSTED, GEORGE B., A. M., Tutor in Mathematics, Princeton Coll.	1878.
1876.	HART, EDWARD, B. S., Assistant Professor of Chem., Lafayette Coll.	1878.
1876.	HERING, DANIEL W., C. E., Civil Engineer.	1878.
1876.	ILES, MALVERN W., Ph. D., Chemist, Colorado.	1878.
1876.	JACQUES, WILLIAM W., S. B., Fellow in Physics.	
1876.	LANMAN, CHARLES R., Ph. D., Assistant Professor of Sanskrit.	1877.
1876.	MEANS, D. MACGREGOR, A. B., Professor in Middlebury Coll., Vt.	1877.
1876.	MORSE, HARMON N., Ph. D., Assistant Professor of Chemistry.	1876.
1876.	PAGE, WALTER H.,	1878.

Appointed.		Retired.
1876.	POINIER, P. PORTER, ... Died in June, 1876.	1876.
1876.	PRESTON, E. DARWIN, B. C. E., ... Civil Engineer.	1878.
1876.	RICE, HENRY J., S. B., ...	1878.
1876.	ROYCE, JOSIAH, Ph. D., ... Assistant Professor of Literature, Univ. of Cal.	1878.
1876.	SIHLER, ERNEST G., Ph. D., ... Fellow in Greek History.	
1876.	VAN VORST, FREDERICK B., A. B., ...	1877.
1876.	WHEELER, JOHN H., A. B., ... Fellow in Classics of Harv. Univ.; Student in the Univ. of Bonn.	1877.
1877.	CLARKE, SAMUEL F., Ph. B., ... Fellow in Biology.	
1877.	HALL, LYMAN B., Ph. D., ... Fellow in Chemistry.	
1877.	SAVAGE, A. DUNCAN, A. M., ... Fellow in Greek.	
1877.	FRANKLIN, FABIAN, Ph. B., ... Fellow in Mathematics.	
1877.	SIHLER, CHRISTIAN, M. D., ... Fellow in Biology.	
1877.	ALLINSON, FRANCIS G., A. B., ... Fellow in Greek.	
1878.	BLOOMFIELD, MAURICE, A. M., ... Fellow in Philology.	
1878.	FAHLBERG, CONSTANTINE, Ph. D., ... Fellow in Chemistry.	
1878.	HALL, EDWIN H., A. B., ... Fellow in Physics.	
1878.	HARDING, EDWARD C., A. M., ... Fellow in Greek.	
1878.	OTT, ISAAC, M. D., ... Fellow in Biology.	
1878.	SEWALL, HENRY, S. B., ... Fellow in Biology.	
1878.	STRINGHAM, WASHINGTON I., A. B., ... Fellow in Mathematics.	
1878.	YOUNG, ABRAM V. E., Ph. B., ... Fellow in Chemistry.	
1878.	HEMPHILL, CHARLES R., A. M., ... Fellow in Greek.	
1878.	MARQUAND, ALLAN, A. B., ... Fellow in Philosophy.	
1878.	VAN VELZER, CHARLES A., B. S., ... Fellow in Mathematics.	

GRADUATES.

1878.

HENRY C. ADAMS, ...	Ph. D.
THOMAS CRAIG, ...	Ph. D.
ERNEST G. SIHLER, . . .	Ph. D.
JOSIAH ROYCE, ...	Ph. D.

UNIVERSITY SCHOLARS.

1876.

G. W. MCCREARY. A. SPRIGG.

1877.

E. H. SPIEKER.

B.

Publications.

CHARTER; FOUNDER'S WILL; BY-LAWS. 1874.

INAUGURAL ADDRESSES. Feb. 22, 1876.

ANNUAL REPORTS OF THE PRESIDENT:
First. January 1, 1876.
Second. January 1, 1877.
Third. September 1, 1878.

OFFICIAL CIRCULARS ISSUED IN 1876-7;
1. Preliminary Information.
2. Admission of Scholars.
3. Bestowal of Fellowships.
4. Partial Arrangements for Instruction.
5. Register of Members of the University.
6. List of Periodicals.
7. Register for the Preliminary Year, (second edition.)
8. Instruction in Chemistry, Physics and Biology.
9. Synopsis of Lectures on "Torts," by Judge Cooley.
10. Programme for the Year, 1877-8.
11. Announcement of a course preliminary to Medicine.

OFFICIAL CIRCULARS ISSUED IN 1877-8.
1. Instruction in Physiology for School Teachers.
2. Register for the Second Year.
3. Synopsis of Lectures by Professor Cooley.
   Synopsis of Lectures by Professor Allen.
4. Bestowal of Fellowships.

(The numerical sequence was here given up.)

Programme of Mathematical Courses for 1878-9.
Programme of Biological Courses for 1878-9.
Programme of Chemical Courses for 1878-9.
Programme of Collegiate Courses for 1878-9.

Programme of Philological Courses for 1878–9.
Programme of Preliminary Medical Course for 1878–9.
Programme of Courses in Romance Languages for 1878–9.
Programme of Historical Courses for 1878–9.

SCIENTIFIC PAPERS:—published under the auspices of the University:

American Journal of Mathematics:
No. 1. March, 1878.
2. July, 1878.
3. September, 1878.
4 (in press.)

Notes from the Chemical Laboratory:
No. 1– 3. May, 1877.
4– 8. December, 1877.
9–12. June, 1878.

Notes from the Biological Laboratory:
(in preparation.)

MISCELLANEOUS PAPERS:

Suggestions in respect to a School of Practical Astronomy by Prof. Newcomb, Dec. 18, 1878.
Extracts from Lectures on Medical Education by Dr. Billings.
Reference List of Books on Philosophy, (for Prof Morris.)
Reference List of Books on Political Economy, (for Prof. Walker.)
Reference List of English and Scotch Ballads, (for Prof. Child.)
First Bestowal of Degrees, June 13, 1878, (Broadside.)
Reception of Dean Stanley, Sept. 30, 1878.

C.

Report of Chesapeake Zoölogical Laboratory.

Summer of 1878.

To the President of the Johns Hopkins University:

DEAR SIR: I have the honor to submit to you the following report of the Chesapeake Zoölogical Laboratory of the University for the summer of 1878.

The Trustees of the University having given their consent to the establishment, as a branch of the biological department of the University, of an experimental sea-side Laboratory for the study of the zoölogy of the Chesapeake Bay, I visited the lower part of the bay last April in order to select the best place for the experiment. The configuration of the bay is such that, if other things were equal, the proper site for a laboratory would be at or very near the southern point of the eastern shore. Most of the fresh water enters the bay upon the western side, and there is accordingly an outward current of somewhat brackish water down the western shore, while the pure salt water, brought in from the ocean by the tide, sets in most strongly along the eastern shore, which is, therefore, a favorable point for the collection of many strictly marine animals which are not found upon the opposite side.

On visiting the eastern shore I found that there are no buildings proper for use as a laboratory in a fit place, and this, together with the unhealth-

fulness of this shore, induced me to forego the advantages of a location close to the open ocean and to select a point upon the western shore.

On this side of the bay several good places were found, but the best appeared to be the incompleted fortification known as Fort Wool. This is an artificial island made by dropping granite rocks into the water, thus elevating an area of about six acres above high tide level. The fort is situated in the mouth of Hampton Roads, about one mile and a half from one shore and three miles from the other, and about twenty miles from the ocean.

The area of six acres is almost covered with the incompleted fortification and building material, and the available space is thus reduced to about half an acre. In this space are two large frame buildings, well lighted, near the water, and adapted for use as a laboratory. Application was accordingly made, near the end of April, to Major-General Q. A. Gilmore, the officer in charge of the property, for permission to occupy them for the summer for that purpose. Through the kindness of the late Professor Henry and of Professor Baird, the Secretary of War was also informed in regard to the nature of the project, and on May 22d, the following permission was received from General Gilmore:

"OFFICE OF THE CHIEF OF ENGINEERS,
"*Washington, D. C., May 20th, 1878.*

"LIEUT. COL. Q. A. GILMORE,
"*Corps of Engineers,*
"*New York City.*

"SIR:—The letter of Dr. W. K. Brooks of the Johns Hopkins University of Baltimore requesting permission, to occupy, with his class the buildings at Fort Wool, Va., to be used as a laboratory and quarters during the summer, which was referred by you to this Office, May 7, 1878, with favorable recommendation, was duly received and forwarded to the Secretary of War, with the following enclosement:

"OFFICE OF THE CHIEF OF ENGINEERS,
"*Washington, May 9th, 1878.*

"Respectfully forwarded to the Honorable the Secretary of War.
"It is recommended that permission be granted to occupy the buildings for the purpose specified, subject to such regulations as may be established by Lieut. Col. Gilmore.
"(Signed) A. A. HUMPHREYS,
"Brig. Gen. Chief of Engineers.

"It has been received back endorsed as follows:
"Granted as recommended by the Chief of Engineers.
"By order of the Secretary of War,
"(Signed) H. T. CROSBY,
"May 16th, 1878. "Chief Clerk.

"Copies of both endorsements are furnished for your information and guidance.
"By command of Brig. Gen. Humphreys,
"Very respectfully,
"Your obed't servant,
"(Signed) W. J. TWINING,
"Major of Engineers.

"The foregoing copy of the correspondence on the subject of the request of Dr. W. K. Brooks of the Johns Hopkins University, Baltimore, Md., is respectfully furnished for his information.
"There are no regulations that I wish to establish except that the duties of the Fort Keeper at Fort Wool are not to be interfered with, and that the Johns Hopkins University will hold itself responsible for any loss or damage to the property of the United States in the fort, resulting from its occupancy by the University students.
"Very respectfully,
"(Signed) Q. A. GILMORE,
"Lieut. Col. of Engineers,
"Brev't Maj. Gen., U. S. A."

The Trustees of the University having complied with the above conditions, a circular was issued May 22d, and the necessary outfit was purchased, and the laboratory was opened at Fort Wool on Monday, the 24th of June, 1878, and was occupied until Monday, August 19th, or eight weeks.

Owing to the unavoidable postponement of the announcement of the proposed laboratory until so short a time before the opening, the number of applicants for admission, was quite small, and many persons who would have been glad to join the party were prevented by other plans which they had formed for the summer.

MEMBERS OF PARTY.—The following is the list of scientific students of the party:

W. K. BROOKS, *Associate in Biology, Johns Hopkins University.*
* P. R. UHLER, " " " " " "
H. SEWALL, *Fellow, Johns Hopkins University.*
H. J. RICE, " " " "
CHR. SIHLER, " " " "
AUGUST SCHMIDT, *Teacher of Nat. Science, Zion School, Baltimore.*
N. B. WEBSTER, *Prin Webster Military Acad., Norfolk, Va.*
T B. WEBSTER, M. D., " " " " "
MRS. N. B. WEBSTER, " " " " "
*W. R. BOOKER. M. D., *Baltimore, Md.*

The above party, with the two exceptions noticed, were at Fort Wool during the whole or the greater part of the session.

LIBRARY AND OUTFIT.—Twelve microscopes, a number of reagent bottles and reagents, and twelve lecture-room chairs, were taken to Fort Wool from the Biological Department of the University.

Those books in the University Library which were likely to be of use to us during the summer, were taken with us, and a small room, furnished with shelves, was set apart at Fort Wool as a library. A number of important books, which our own library does not contain, were sent to us from the Library of Congress at Washington, through the Smithsonian Institution. My own zoölogical library was placed at the disposal of the students, and a few other books were lent us.

The Superintendent of the Maryland Fish Commission allowed us to take with us a large seine belonging to the Commission, and through his kindness three large row boats, the property of the Maryland Commission, were sent to us from Washington by the United States Commission.

The United States Fish Commission also sent us a small dredge.

The remainder of the outfit was purchased by the University, and consisted of microscopic material and glass ware, laboratory tables and chairs, aquaria, tubs, buckets, nets, a dredge and other collecting apparatus, and cooking utensils and table furniture for a party of twelve persons.

BOATS.—Professor Baird, of the Smithsonian Institution, attempted to obtain for us, from the Navy Department the use of a steam launch, but, at the time for opening the laboratory, he had not succeeded, and as it was necessary for us to have daily communication with the shore from the first, I was unable to wait, and engaged a sail-boat and boatman.

Although our failure to obtain the launch was a great disappointment, it proved to be for the best, as the expense would have compelled us to cut our session short nearly one-half, and an acquaintance with the neigh-

* With the party only a few days.

boring waters has shown me that a small launch would not have been of very great value to us, as it would not have enabled us to safely reach essentially different waters from those immediately around us.

Much valuable help was afforded us by the captains of steam tugs, several of whom took our party out on short dredging excursions. As this service was gratuitous, and could not be allowed to interfere with business, the excursions were necessarily very short, but, nevertheless, very advantageous to us.

Two captains especially, Capt. Milton S. Lawrence and Capt. D. S. Leffler, took an intelligent interest in our work, and gave us every facility in their power for furthering our investigation. The help which these gentlemen gave us deserves mention, as they were the owners of their boats, and, in addition to the running expenses, they, at all times, took the risk of losing an opportunity for employment, by the delay which the necessity for carrying our party back and landing us, might cause them.

The U. S. Quartermaster at Fort Monroe placed the revenue cutter, which is in his charge, at our service for two hours, a few days before the laboratory closed, and thus enabled us to make a short dredging excursion, which yielded interesting results.

CHARTS, &C.—Application was made to the U. S. Coast Survey for charts, and the government charts of the waters within a radius of fifty miles of Fort Wool, were sent us, but, by some mistake, they did not reach me until after the closing of the laboratory.

As the fishery laws of the State of Virginia prohibit dredging and fishing in certain waters of the State during summer, application was made to the Governor for exemption from the restrictions of these laws, and through his action the following permission was received from the Fish Commissioners of Virginia:

"The Johns Hopkins University having established a station in the vicinity of Fortress Monroe for the study of marine zoölogy, and it being of the greatest importance to science and to the interests of the State that every liberty or facility should be given to the free prosecution of the investigations proposed, therefore Permission is given to Prof. W. K. Brooks in charge of such station, and to all of his students to take from any of the waters of the Commonwealth, by such means as are most convenient such fish or shells or other forms of invertebrate life as may be needed as material for the proposed investigations.

"(Signed) M. MCDONALD,
"Com'r of Fisheries, Va."

THE LABORATORY.—The Laboratory was designed to accomplish four objects: to furnish advanced students with opportunities for original investigation; to provide material for winter work in the University; to enable less advanced students to become acquainted with the many interesting forms of life which can be studied only at the seashore, and to give them an opportunity to become practically acquainted with the methods of marine zoölogical work; and to increase our scientific acquaintance with the zoölogy of the Chesapeake Bay.

The in-door facilities for advanced investigation were perfectly adequate, and I do not know of anything which was wanting which it would be worth while to buy for a temporary laboratory.

As regards the out-of-door facilities, an abundant supply of interesting material for study could be collected without leaving the fort. A strong current runs close to the walls of the fort, and thus carries a great body of water—fifteen or twenty miles—past its walls at each turn of the tide. Free-swimming animals were thus carried by in great numbers, and the water was full of embryos and the free-swimming larva of fixed animals which were not to be found in our immediate vicinity. Although we were too far from the ocean to meet with any strictly pelagic forms, and

our fauna was thus somewhat restricted, there was, at all times an abundant supply of material for study, and the facilities for embryological work were fully equal to those of any zoölogical station upon our coast.

The opportunities for collecting and studying adult animals were by no means so good, for, while we had embryos of all kinds brought to us by the water, the mature animals could only be obtained by going to them. The nature of the bottom in the vicinity of Fort Wool is such that the results obtained by dredging were not very satisfactory, and as we had no means for making extended dredging and collecting excursions, we were unable to find many interesting animals which were shown, by the presence of their embryos at Fort Wool, to be quite numerous within fifteen or twenty miles of us. The collections of adult animals brought back to Baltimore for laboratory work were, for this reason, quite small, although we succeeded in getting a good supply of a few very desirable types.

The opportunities afforded to the less advanced students were also satisfactory.

No lectures were given, as the needs of the different members of the class were too diverse to make lectures advantageous.

Each student had access to the library, and the proper reading to be done in connection with the study of each form of life was pointed out by the Associate in charge. They had the benefit of all the distant excursions which we were able to make, and were thus enabled to become familiar with the methods of deep-water collecting; and there was at least one surface-collecting excursion every day of the season, and more than one on every favorable day.

There were also several shore-collecting expeditions, and both sides of Hampton Roads were visited and examined. In these ways the students were able to acquire familiarity with the habits of marine animals while gathering the material for laboratory work.

In the Laboratory, each student had ample room for dissecting and for microscopic work, as well as all the necessary facilities for keeping and observing living animals in aquaria. Only one of the students, during the past summer, had ever done any work in marine zoölogy before, but if the laboratory should be continued, several of the class would be able to take up subjects for original investigation next year.

SCIENTIFIC RESULTS.—The amount of advantage which zoölogical science can derive from the discovery and description of new species is very slight, as compared with that which is gained by the careful study of the whole life-history of any form of life—old or new. As this work can be done only where the living animals can be had, it is properly *laboratory* work, as distinguished from *museum* work, or the identification of species.

I accordingly made no attempt to find and describe new forms, but devoted all our time to the careful study of a few important species; selecting for this purpose, from among those which were abundant at our station, the ones a knowledge of which is most desirable to science. I may say, however, that two of the forms which we selected for careful study were new additions to the fauna of this region.

One of these, *Amphioxus*, was studied by Mr. Rice.

Amphioxus is a small worm-like animal, the lowest of the vertebrates, and it is of very great scientific interest since it has preserved many evidences of a relationship to various groups of invertebrates, and thus serves to bridge over the gap which was supposed by Cuvier and Agassiz to separate the vertebrata from all lower forms of life.

Its embryology, which may be termed the key to the embryology of all the higher animals, has been ably studied by several of the most dis-

tinguished zoölogists of Europe, and a number of papers have appeared upon the subject within a few years. We fortunately found several larvæ which had passed beyond the stages studied by these naturalists, but which had not yet acquired the adult characteristics. Mr. Rice succeeded in keeping these alive, and was thus able to supply the information necessary to complete our knowledge of its development. He also made very interesting observations upon the habits of *Amphioxus*. *Amphioxus* has been found upon the coast of South Carolina, and last winter one of the assistants of the Smithsonian Institute discovered it in the Bermudas; until this summer these were the only instances of its occurrence upon this side of the Atlantic.

Another important form of life which was carefully studied, is *Lingula*, one of the Brachiopods, a group which has been of great importance during past geological periods, but has now almost disappeared. *Lingula* itself has persisted unchanged from the time of formation of the oldest fossiliferous rocks, and is one of the first living things of which we have any knowledge. As *Lingula* has not before been found under circumstances which admitted of careful study, almost nothing was known of its development, but I was able to trace its life history this summer from a very early stage up to the adult form, and to show that, old as it is, each individual, from the time of the lower Silurian up to the present time, has transmitted to its children a developmental record which proves that *Lingula* itself is the descendant of a much older form. It is hoped that a publisher will soon be found for these and other papers which will give the scientific results of our summer's work in full.

At the opening of the Laboratory, we hoped to be able to study the development of the oyster, but we found that we were too late by several weeks. What little information we were able to obtain has been placed at the disposal of the Fish Commissioner of Virginia.

At the close of our season, Mr. Rice joined the U. S. schooner Palinurus, which had been sent by the U.S. Coast Survey to investigate the physical geography of the oyster beds of the Chesapeake.

A report of our Summer's work would be incomplete without an expression of the indebtedness of our party to Mr. Walter Allen, the Keeper of Fort Wool, whose constant efforts to make our life at the fort pleasant and our property safe, were warmly appreciated by all of us.

Yours truly, W. K. BROOKS.

D.

Johns Hopkins Philological Association.

TITLES OF THE PRINCIPAL PAPERS PRESENTED IN THE ACADEMIC YEAR 1877–78.

1. The Two Original *ka*-sounds in Indo-European. Oct. 6, 1877. By Dr. LANMAN.
2. A Literary Survey of the Myths in Plato. Nov. 2, 1877. By Mr. SIHLER.
3. Schiller's Ethical Studies. Dec. 7, 1877. By Mr. ROYCE.

4. Do the Romance Languages hold the same Relation to the Latin that the Modern Prakrit Dialects do to Sanskrit? Jan. 4, 1878. By Mr. ELLIOTT.
5. The Oaths in the Greek Orators. Feb. 8, 1878. By Mr. SAVAGE.
6. The Home of the Shemitic Peoples. March 1, 1878. By Mr. MURRAY.
7. On Prepositions. April 5, 1878. By Mr. BRANDT.
8. A Critical Review of Kirchhoff's Treatise—"Upon the Time of the Composition of Herodotus' History." May 3, 1878. By Professor MORRIS.

LIST OF MINOR COMMUNICATIONS PRESENTED DURING THE ACADEMIC YEAR 1877–78.

1. On the name "Pompeji." By Mr. LANMAN.
2. On the name "Shiloh" (Shilôh). By Mr. MURRAY.
3. A Criticism of Merivale's Account of the scandalous Bargain made by two of the Consular Candidates with the Consuls for B. C. 54, recorded by Cicero, *ad Att.* iv. 18 2. By Professor MORRIS.
4. The Non-identity of *-ter* and *-der* in some Germanic Prepositions (*hinter*, *nieder*, *under*, etc), with the comparative Endings *-tara* and *-τερο-ς*. By Mr. BRANDT.
5. Remarks upon a Cretic Inscription running from right to left and from left to right, now deposited in the Louvre (with description of paper cast thereof). By Mr. LANMAN.
6. A Chapter from the Attic Law of Inheritance. By Mr. SIHLER.
7. On the Origin of the Hexameter. By Prof. F. D. ALLEN of Cincinnati. (Read by Mr. LANMAN.)
8. On the Relation of *herde*, *hort*, *horde*, *hürde*. *Horde* is not Indo-European. By Mr. BRANDT.
9. On the Historical Development of the Forms of the Instrumental Singular Masculine of *a*-stems in Sanskrit, with a Criticism of the Views of Schleicher. By Mr. LANMAN.
10. The Contributions of Schanz to Platonic Text-Criticism. By Mr. SIHLER.
11. Review of Lindner's "*Altindische Nominal-bildung.*" By Mr. LANMAN.
12. The Ars Rhetorica of Dionysius of Halicarnassus. By Mr. SIHLER.
13. On the Oath of Rhadamanthus. By Mr. SAVAGE.
14. On the use of the Three Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Demosthenes, and Isocrates. By Mr. ALLINSON.
15. On the name *Σαγχουνιάθων*. By Mr. MURRAY.
16. The Life, Work, and Spirit of August Schleicher. By Mr. LANMAN.
17. The use of Capital Letters in writing and printing German. By Mr. BRANDT.
18. A Review of Edw. T. Williams' Work "The Science of French Conjugation." By Mr. EDW. A. FAY of Washington. (Read by Mr. LANMAN.)

The average number of members present was 13.

Historical and Political Science Association of the Johns Hopkins University.

TITLES OF THE PRINCIPAL PAPERS READ DURING THE ACADEMIC YEAR, 1877–8.

1. The Village Communities of Ancient Germany and Mediæval England. An Introduction to the Study of New England Towns and the Institutions of Local Self-Government in America. By H. B. ADAMS.
2. The Ordinance of 1787 for the Government of the North-Western Territory. A paper showing the historic origin of this Act of National Legislation and the importance of the Ordinance as an element of Constitutional Law. By AUSTIN SCOTT.
3. The Economy of Coöperation. An Essay afterwards read before the *American Social Science Association* at its meeting in Cincinnati. By H. C. ADAMS.
4. The *Tractatus Theologico-Politicus* of Spinoza. A Philosophical Essay in which Spinoza was presented as the champion of religious liberty. By JOSIAH ROYCE.
5. The Punitive Power of the State An inquiry into the grounds of legal punishment and an examination of the views advanced in Woolsey's Political Science. By WILLIAM T. BRANTLY.
6. The Public School System; an inquiry as to its Foundations. By D. C. GILMAN.

LIST OF SOME OF THE MINOR COMMUNICATIONS PRESENTED DURING THE ACADEMIC YEAR, 1877–8.

1. Tramps. A paper afterwards read before a public convention, in Baltimore, of Maryland gentlemen, for the discussion of the tramp-question. By H. C. ADAMS.
2. The Maryland State Papers. A communication showing the wealth of historical materials now lying unpublished at Annapolis and in the library of the Maryland Historical Society. By H. B. ADAMS.
3. The National Archives. An explanation of the character and arrangement of the public documents and historical collections (letters, manuscripts, etc.) belonging to the United States. By AUSTIN SCOTT.
4. The Influence of Alexander Hamilton in the Formation of the Constitution of the United States. By JOSEPH H. TYLER.
5. The Original Conception of the Town as an Institution. By W. F. ALLEN, of the University of Wisconsin.
6. Greek Cities. Fragments from Greek writers, illustrating the historical village community and the Federal Constitution of the *Commonwealths of Greece*. By A. D. SAVAGE.
7. Review of the Statistics of Bengal and of the Indian Systems of Land-Tenure. By C. R. LANMAN.
8. Review of Dr. Woolsey's Theories Concerning the Educational Power of the State. By D. C. GILMAN.
9. The School System of Connecticut, with Particular Reference to that of New Haven. By F. A. WALKER, of Yale College.
10. The School System of Baltimore. By Judge GEO. WM. BROWN.

Besides the consideration of such themes as the above, it is the practice of the Association to review the current magazine literature, (English, German and French,) relating to historical and political science.

Scientific Association of the Johns Hopkins University.

LIST OF PAPERS PRESENTED DURING THE ACADEMIC YEAR, 1877–78.

1. On Diamagnetic Experiments. By W. W. JACQUES.
2. On the Early Stages in the Development of Gasteropods. By W. K. BROOKS.
3. A resumé of Maxwell's Theory of Light. By H. A. ROWLAND.
4. On the oxidation of Mesitylene Sulphamide. By L. B. HALL.
5. An Historical Sketch of the Science of Linkage By G. B. HALSTED.
6. A Review on the Expenditure of Energy by Working Muscle. By H. N. MARTIN.
7. Some new experiments on the mechanical equivalent of heat. By H. A. ROWLAND.
8. On the formation of the female pelvis. By C. SIHLER.
9. On an application of modern chemistry to modern algebra. By J. J. SYLVESTER.
10. On the oxidation of xylene sulphonic acids. By M. W. ILES.
11. On the theory of the elastic relation of crystals. By W. E. STORY.
12. A review of some recent investigations in Valence. By IRA REMSEN.
13. On the education of women from a zoölogical standpoint. By W. K. BROOKS
14. On a true criterion for color correction in the astronomical objective. By C. S. HASTINGS.
15. On the influence of stimulation of the optic lobes upon the respiratory centre of the frog. By H. N. MARTIN.
16. A note on recent experiments on the liquefaction of gases. By H. A. ROWLAND.
17. Contributions toward a history of the Maryland Cambari. By P. R. UHLER.
18. Nitro-sulpho-benzoic Acids By E. HART.
19. A resumé on the theory of Groups. By W. E. STORY.
20. The Urodela of North America By S. F. CLARK.
21. On iron supports for bridges. By D. W. HERING.
22. On Van't Hoff's Hypothesis. By IRA REMSEN.

E.

List of Donors to the Library, Jan. 1, 1877, to Sept. 1, 1878.

GIFTS OF BOOKS HAVE BEEN RECEIVED AS FOLLOWS:

From Prof. HENRY ADAMS, the Author. New England Federalism. Boston, 1877. O.
J. CARSON BREVOORT, LL. D., the Author. Verrazano, the Navigator. New York, 1874. O.
Hon. N. BOOTH, U. S. Senate. Reports of the U. S. Commissioners to Vienna Exhibition. Wash., 1876, 4 vols. 8vo.
R. K. BEER, Ph. D., the Author. Pharmaceutical Terminology. Balt, 1876. 12mo.
B. D. BARROLL, the Author. Maryland Equity. Baltimore, 1878. O.
CLARK & MAYNARD, the Publishers. Grammaire Française moderne, par Victor Alvergnat. New York, 1877. 12mo.
Elementary French Grammar, by J. G. Keetels. New York, 1877. 12mo.

From CLARK & MAYNARD, the Publishers. Analytical and Practical French Grammar, by J. G. Keetels. New York, 1877. 12mo.

GEO. H. CALVERT, the Author. Life of Rubens. Boston, 1876. 12mo.

Dr. J. S. CONRAD, Report of the Board of Managers of the Maryland Hospital for the Insane. Dec., 1876. Baltimore.

Hon. T. M. COOLEY, the Author. A Treatise on the Law of Taxation. Chicago, 1876. O.

Prof. GEO. H. COOK, State Geologist, Geological Survey of N. J. Report on Clays. Trenton, 1878. O.

Tenth Annual Report of the State Board of Agriculture, for 1876. Trenton, 1877. 8vo.

Hon. GEO. H. CROSWELL, Governor of Michigan. Geological Survey of Michigan, 1869–73; New York, 1873–76. 3 vols. O.

CUSHINGS & BAILEY, Publisher's Trade List Annual, 1877. New York, 1877. 8vo.

Prof. A. J. DU BOIS, the Translator. Weyrauch, on Structures of Iron and Steel. New York, 1877. 8vo.

Hon. J. EATON, Commissioner. Report of the Commissioner of Education, for 1876. Washington, 1878. O.

H. R. H. GASTON D'ORLEANS, Count d'Eu. Brazilian biographical annual, by J. M. de Macedo. Rio de Janeiro, 1876. 3 vols., 8vo.

TOWNEND GLOVER. Manuscript Notes of Insects, Native and Foreign; Order Hemiptera; Sub-order Heteroptera. Washington, 1876. s. F.

SAMUEL GARNER. Maryland Convention, 1850. Annapolis, 1850. O.

J. O. HALLIWELL PHILLIPS, the Author. Illustrations of the Life of Shakespeare. Part I London, 1874. Fol.

Catalogue of his Shakespeare-Study Books. London, 1876. 8vo.

Brief Hand List. London, 1876. 8vo.

Brig. Gen. A. A. HUMPHREYS, Chief of Engineers, U. S. A. U. S. Geological Exploration of 40th Parallel, under Clarence King. Vol. 2. Descriptive Geology, by Arnold Hague and S. F. Emmons. Washington, 1877. Q.

Same. Vol. 4, Paleontology. Washington, 1877. Q.

Annual Report of the Chief of Engineers. Washington, 1876. 3 vols. 8vo.

Report of a reconnoissance from Carroll, Montana, etc., by W. Ludlow. Washington, 1876. 4to.

M. W. ILES, Ph. D. Proceedings of the Davenport Academy of Natural Sciences. Vol. 1. Davenport, Iowa, 1876. 8vo.

Formulæ for Railroad Excavation, etc., by J. W. Davis. New York, 1876. 8vo.

Dr. JOSEPH JONES, the Author. Explorations of the Aboriginal Remains of Tennessee. Washington, 1876. 4to.

REVERDY JOHNSON. Das Recht des Besitzes, by Friedrich Carl von Savigny. Giessen, 1837. 8vo.

Die formellen Verträge des neueren römischen Obligationenrechts, by Heinrich R. Gneist. Berlin, 1845. 8vo.

Hon. T. J. KNOX. Report of Comptroller of Treasury, Dec. 3, 1877. Washington, 1877. O.

J. W. M. LEE. Historical Research respecting the opinions of the Founders of the Republic on Negroes as Slaves, as Citizens, and as Soldiers, by George Livermore. Boston, 1862. 8vo.

Prof. T. C. MURRAY. Biblical Repertory and Princeton Review, Philadelphia and New York, 1830–64. 35 vols. 8vo.

Prof. H. N. MARTIN. Journal of Physiology. Ed. M. Foster. For the year.

Arbeiten aus der physiologischen Anstalt zu Leipzig. 7ter Jahrgang, 1872. Von C. Ludwig. Leipzig, 1873. 8vo.

Hon. JOHN T. MORRIS, President. Forty-eighth Annual Report of the Board of Commissioners of Public Schools for 1876. Baltimore, 1877. 8vo.

JOHN MURPHY, the Publisher. The History of the Protestant Reformation in Germany and Switzerland, by M. J. Spalding, D. D. 7th ed. Baltimore, 1876. 2 vols. 8vo.

Miscellanea, comprising reviews, lectures and essays, by M. J. Spalding, D. D. 6th ed. Baltimore, 1875. 2 vols. 8vo.

Evidences of Christianity, by M. J. Spalding, D. D. 6th ed. Baltimore, 1876. 8vo.

European Civilization, by J. Balmes. 16th ed. Baltimore, 1850. 8vo.

Rituale Romanum, Pauli V Pontificis maximi jussu editum et a Benedicto XIV. Baltimori, 1872. s. 8vo.

Debates of the Constitutional Convention of the State of Maryland, 1864. Annapolis, 1864. 8vo.

Constitution of the State of Maryland, 1867. Baltimore 1867. 8vo.

Concilii Plenarii Baltimorensis II, ... Acta et Decreta. Baltimorae, 1877. 8vo.

Maryland Code—Public General Laws, compiled by Otho Scott, and Hiram M'Cullough. Baltimore, 1860. 2 vols. 8vo.

Supplements to the Maryland Code, containing the Acts of the General Assembly passed at the Sessions of 1861, 1861–62, 1864, 1865, 1866, 1867, 1868, and 1870. Baltimore, 1868–70. 3 vols. 8vo.

From MACMILLAN & Co., the Publishers, New York. Holy Roman Empire, by James Bryce. 6th ed. London, 1876. cr. 8vo.
Practical Biology, by T. H. Huxley and H. N. Martin. 3d ed. London, 1877. cr. 8vo.
Greek-English Dictionary, by H. G. Liddell and Robert Scott. 14th ed. Oxford, 1870. post 8vo.
Algebra, by Isaac Todhunter. 7th ed. London, 1875. post 8vo.
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BALTIMORE:
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET.
1879.

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FOURTH ANNUAL REPORT

OF

THE PRESIDENT.

To the Trustees of the
Johns Hopkins University:

GENTLEMEN:

In presenting to you a Fourth Annual Report, it seems well to sum up not only the doings of the last academic year, but also to give the results of our observations and experience during the last three years. It will be necessary to repeat occasionally some statements which have already been publicly made,—but a general review, even including such repetitions, can hardly fail to be of service to those among us who are engaged in instruction and administration,—while it will enable those at a distance, who are interested in this institution, to understand the principles and methods by which our work is governed.

The Trustees of Johns Hopkins, upon the death of the Founder, held their first meeting February

6th, 1874, and soon commenced the study of university organizations, by conferences and correspondence with the Presidents and Professors of American colleges, by personal visits to leading institutions, and by sending a representative to visit some of the most renowned seats of learning in the old world. Their plans were so far matured in the course of two years that they were publicly made known on the twenty-second of February, 1876. In the autumn of that year, the staff of teachers was brought together, and instruction began on the third of October.

The University entered upon its work with these advantages:—a large fund yielding a steady income; freedom from political and denominational control; an open field unoccupied by any endowment like ours; a central position in one of the oldest States and in the neighborhood of the great scientific establishments of Washington; a library for scholars already instituted; and the immediate prospect of a large General Hospital which may be the nucleus of a school of medicine.

The Trustees who were charged by Johns Hopkins with the oversight of this great project, early came to the conclusion that they would not attempt to rival or copy any existing institution, but would rather try to make a positive contribution to American education. They recognized

the fact that the wants of Baltimore and the region near to it were to be first considered; and they have steadily endeavored to develop an establishment which should aid and be aided by the plans and funds of other foundations, so that in time all the educational work of Baltimore may go forward in harmony.

The local institutions with which it seemed especially desirable to coöperate were these:—the Peabody Institute, having an endowment of $1,250,000, maintaining a large and well chosen Library, a system of public lectures, a conservatory of music, and an art museum; the Johns Hopkins Hospital, the buildings of which are in process of construction; the Maryland Institute, which is the proper nucleus for a Technological School; the Maryland Academy of Sciences, which has undertaken to establish a museum of Natural History; the professional schools of Law and Medicine, and also those of Dentistry and Pharmacy; the Historical, Mercantile, Law, and Medical Libraries; the State Normal School; and—if last to be mentioned, first to be thought of—the public schools, of which, so far as boys are concerned, the City College is the head, and the private schools, maintained by individual or associated efforts.

While looking directly at local requirements, the Trustees had no desire to restrict the useful-

ness of the University to the city or the State, but were in hopes that it would attract many scholars from a distance, by the ability of its Faculty, by the wisdom of its methods, and by the fulness of its apparatus; and that by its investigations and publications its influence might extend beyond any provincial limits.

Having these aims, the next question to be considered was the interior organization of the University,—should it follow an American, an English, a French, or a German model; or should it gather from many sources educational methods to be adapted to the wants of this country and brought into harmony with our conditions, political, ecclesiastical and social. There was no hesitation on this point. The new foundation was to base its operations upon the experience of many and diverse institutions—ascertained by inquiries at home and abroad, among the most enlightened teachers and administrators.

It soon became clear that whatever nomenclature may be adopted, and whatever varieties of form may be seen in the higher educational foundations of modern times, there is an important distinction between the work of colleges and universities.

According to acknowledged precedents still rigidly followed in the old world, universities exercise these fourfold functions:—(1) they pro-

vide advanced instruction in the chief departments of literature and science,—and usually, also, in one or more of the so-called learned professions; (2) they bring together books, apparatus, instruments, works of art and collections in natural history; (3) they encourage investigation and the publication of important researches, and (4) they confer degrees.

Collegiate instruction is properly introductory to university teaching; it is elementary, formal and disciplinary. It is largely devoted to the training of the intellectual powers and the formation of habits of attention, acquisition, memory and judgment,—while it stores the mind with the elements of knowledge. A University cannot thrive unless it is based upon a good collegiate system; and it may rightly encourage or establish a college, if needed, as an important department of its activity.

Let us now examine our work in these various aspects:

1. ***Respecting instruction.*** Thus far no provision has been made for instruction in any of the professions,—but attention has been concentrated on those themes which are commonly spoken of as pertaining to THE PHILOSOPHICAL FACULTY OF A UNIVERSITY; and, so far as I can judge, equal regard has been shown for those subjects which are commonly classed as "scientific" and those which

are classed as "literary." There have been resident professors and assistant professors in Mathematics, Physics, Chemistry, Biology, and Comparative Anatomy; in Greek, Latin, and English, as well as in the Teutonic, Romance, Sanskrit, and Semitic languages. History, Political Economy, Logic, Ethics and the History of Philosophy have also been taught. The resident staff has received the coöperation of non-resident professors who have from time to time given courses of lectures supplementary to those which are given throughout the year. In the selection of permanent and temporary teachers the effort has been made to secure the services of such as are acknowledged to be leaders by those who are of authority in the same departments of study. Some have already won renown; others, who are younger, have given indications of unusual promise; most are excellent teachers as well as independent investigators; the appointments have never been made because of local, ecclesiastical, or personal ties; and every one has been encouraged to render the best and highest services of which he was capable. As it is not easy to give in general phrases a just idea of the instructions which have been in progress, a tabular view of subjects, teachers and hours will be printed in the appendix to which those who are interested in such details may readily refer, if they desire to

see how far the expectations which were awakened three years ago have been fulfilled. The only guarantee of efficient work in any university or college is to be found in the character, attainments, and experience of the academic staff. Excellent teachers are sometimes fettered or embarrassed by unfortunate conditions, such as the over-pressure of engagements or the inadequacy of instruments, but here, every chief instructor has been free to follow those plans which seemed to him best adapted to his theme and to his pupils; no one has been burdened by too many or too onerous appointments; and the requisite apparatus, both literary and scientific, has been liberally provided. Lectures, recitations, personal conferences, formal examinations, laboratory practice and field observations have all been employed. Thus far there has been no occasion to offer prizes or to mark the comparative standing of different scholars. The classes have for the most part been small, and it has been easy to adapt the method of teaching to the needs of individuals. Enthusiastic and steady devotion to study, encouraging in a high degree to the teachers, has been characteristic of the classes. Courses of summer reading have been marked out for those who desired them and have been made the subject of subsequent examinations. Associations in which the professors and the more advanced scholars have alike

taken part have been steadily maintained; and in Mathematics, Greek, and History, some of the methods of the German seminaries have been successfully introduced.

Throughout all the departments a spirit of earnest work, of order, and of good will has been manifested, making us in fact, as well as in name, a College,—SOCIETAS MAGISTRORUM ET DISCIPULORUM.

Graduate Students. The reputation of an able staff has attracted a number of advanced students sufficiently large to make it clear (as many counsellors predicted at the beginning of our work), that educated young Americans are ready to accept the opportunities here offered to them. There have been connected with this institution during the last three years, 127 graduate students, 51 of whom have held Fellowships. They came from the following States:

Maine,	1	Mississippi,	1
Vermont,	2	Louisiana,	1
Massachusetts,	10	Ohio,	3
Connecticut,	2	Michigan,	1
New York,	12	Indiana,	2
New Jersey,	7	Illinois,	3
Pennsylvania,	6	Wisconsin,	1
Maryland,	53	Iowa,	3
[Baltimore, 44.]		Missouri,	1
District of Columbia,	2	Kansas,	1
Virginia,	6	California,	2
North Carolina,	2	Russia,	1
South Carolina,	2	Japan,	1
Georgia,	1		

The Institutions from which they had received degrees were 57 in number,—namely:

Amherst College,	6	Marietta College,	1
Bellevue Hospital Medical School, (N.Y.,)	2	Maryland Agricultural College,	1
Bonn, University of,	1	Maryland, University of,	23
Bowdoin College,	2	Mass. Inst. of Technology,	2
Brown University,	1	Mercer University,	1
California, University of,	2	Michigan, University of,	3
Charleston College, (S. C.,)	1	Muhlenberg College,	1
Cincinnati, University of,	1	Pennsylvania, University of,	2
Columbia College,	2	Physicians and Surgeons, College of, (Balt.,)	1
Columbian University,	1	Princeton College,	5
Concordia College,	2	Pritchett Institute, (Mo.,)	1
Cornell University,	6	Randolph-Macon College,	1
Dartmouth College,	1	Rensselaer Polytechnic Institute,	1
Davidson College,	2	Rochester, University of,	1
Dickinson College,	1	Rutgers College,	2
Dickison Seminary,	1	South Carolina, University of,	1
Drew Theological Seminary,	1	St. John's College,	2
Furman University, (S. C,)	1	Stevens Inst. of Technology,	2
Georgetown College, (D. C.,)	2	Syracuse University,	1
Göttingen, University of,	5	Tokio, University of, (Japan,)	1
Hampden-Sidney College,	1	Virginia, University of,	9
Harvard University,	6	Washington College. (Md.)	1
Haverford College,	3	Washington University, (Balt.,)	2
Heidelberg, University of,	1	Washington and Lee University,	2
Iowa Agricultural College,	1	Wesleyan University,	3
Iowa College,	1	Western Maryland College,	2
Lafayette College,	3	Williams College,	4
Lehigh University,	1	Yale College,	8
Leipsic, University of,	3		

Fellows. Among the graduates the corps of Fellows holds an important place. They are selected by the Faculty and appointed by the Trustees, and are the recipients of an honorary stipend sufficiently large to pay their necessary expenses,—so that they may devote their time exclusively to study. They constitute in fact,

though not in name, a class of young men in training for professorships,—a teacher's class of the highest grade. The importance of this feature in our organization is so great as to call for special consideration here.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions,—(though such persons have not been formally excluded from the competition,) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or determined to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and knowledge. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Faculty to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions and answers submitted to the candidates. First the head of a given department considers, with such counsel as he may command, the applicant's record. The professors as a body then deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the very highest results which could be anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and attractive posts in different parts of the country.

The number of individuals who had been appointed to Fellowships prior to September 1, 1879, was 51; of these 13 began their career in this University as Graduate Students.

The departments of Study of those appointed, were as follows: Mathematics, 6; Physics, 6; Chemistry, 8; Biology, 10; Greek, 8; Comparative Philology, 3; History and Political Science, 3; Philosophy, including Aesthetics, 4; Engineering, 2; Mineralogy, 1.

The present incumbents of Fellowships are 20 in number. Of the 31 others appointed, 16 are now Instructors in Colleges and Universities, (8 here, and 8 elsewhere); 2 are engaged as Teachers in Classical Schools; 2 are attached to the United States Coast Survey, and one to the United States Fish Commission; one is attached to the Metropolitan Museum of Art, in New York City; 4 others are engaged in the practice of professions, other than teaching, (1 Chemist; 1 Civil Engineer; 1 Physician; 1 Lawyer); 4 are still pursuing their studies here or abroad; and one died without entering upon his Fellowship.

The Institutions at which those appointed as Fellows had graduated or received the Baccalaureate degree, were:

Amherst College,	4	Columbian University,	1
Bowdoin College,	2	Concordia College,	2
California, University of,	1	Cornell University,	4
Columbia College,	1	Furman University, (S. C.,)	1

Harvard University,	3	Rensselaer Polytechnic Inst.,	1
Haverford College,	1	Rutgers College,	1
Iowa College,	1	South Carolina, University of,	1
Lafayette College,	2	Stevens Inst. of Technology,	2
Marietta College,	1	Tokio, University of, (Japan,)	1
Mass. Inst. of Technology,	1	Virginia, University of,	5
Michigan, University of,	1	Wesleyan University,	1
Princeton College,	3	Williams College,	2
Randolph-Macon College,	1	Yale College,	6

The Institutions from which the degree of Doctor or Master had been received by the holders of Fellowships were:

Amherst College,	2	Lafayette College,	1
Columbia College,	1	Leipsic, University of,	2
Davidson College,	1	Marietta College,	1
Göttingen, University of,	4	Michigan, University of,	1
Harvard University,	2	Pennsylvania, University of,	1
Heidelberg, University of,	1	Virginia, University of,	1
Iowa College,	1	Yale College,	2

Collegiate Students. In addition to graduates, collegiate students have been received. The number of such who have been enrolled here during the past three years is 91—and almost all of them have come from Baltimore and its vicinity. In order to become "matriculates," or members in full of the university, a rigid examination in Latin, Greek and Mathematics must be passed,—except that scientific students may offer French and German instead of Greek. A good English education with some knowledge of natural science is also expected. Students who are not ready to matriculate in all branches, have been conditionally

received as "candidates" for matriculation, with the understanding that they should quickly comply with all requisitions; and a few who do not propose to become candidates for degrees, have in exceptional cases been admitted as "special students." The policy has been at the outset to invite scholars,—but at the same time to uphold the standard of the best preparatory schools. This is accomplished by prescribing and maintaining a matriculation grade, which is certainly quite as high as American colleges can now insist upon.

After matriculation, the student may follow any one of seven courses which are antecedent to the Baccalaureate degree. These courses are all of them so arranged as to secure a liberal and not a special education; they are supposed to be equally difficult and equally honorable; in them all strict examinations are held, and promotion is only secured by a full compliance with the University requirements. One of these courses provides a thorough classical training; another is chiefly mathematical; a third is based on chemistry and physics; in a fourth, biological sciences predominate; in a fifth, philosophical studies have full recognition; historical and political subjects make the principal themes in the sixth; and in the seventh, modern languages and literature take the place of Latin and Greek. Besides the dominant

or major subjects, minor topics receive attention. By this combination a young man may secure a broad foundation for subsequent work without anticipating his proper professional studies,—and he may, if he chooses, select that course which will tend toward his chosen calling; for example, the biological course is arranged as an introduction to the school of medicine; the course in historical and political science, to the school of law; a different plan of study may lead to the school of theology; and the other courses allow an election between ancient and modern languages, and between the mathematical, physical and chemical sciences.

2. ***Collections of literary and scientific apparatus.*** The Hopkins foundation was preceded by that of the Peabody Institute, already referred to, which has collected an excellent library of over 67,000 volumes, (besides 10,000 pamphlets,) and is constantly increasing. Within the past year, the work of enlarging the Peabody building has been finished, and the accommodations for reading and study have been much improved. It is more and more resorted to by the professors and the scholars of our University, who are in the position to appreciate heartily all that is done by the Provost, the Librarian and the Trustees to make the library a convenient and attractive place for investigation and research. Within its walls some of our com-

pany have spent a large part of their time during the past year.

It would seem as if Mr. Peabody, or his advisers foresaw the day when a company of scholars would be gathered around his foundation. His letter of February 12, 1857, provides—

"For an extensive Library, to be well furnished in every department of knowledge, and of the most approved literature, which is to be maintained for the free use of all persons who may desire to consult it, and be supplied with every proper convenience for daily reference and study, within appointed hours of the week-days of every year. It should consist of the best works on every subject embraced within the scope of its plan and as completely adapted, as the means at your command may allow, *to satisfy the researches of students who may be engaged in the pursuit of knowledge not ordinarily attainable in the private libraries of the country.* It should be guarded and preserved from abuse, and rendered efficient for the purposes I contemplate in its establishment, by such regulations as the judgment and experience of the Trustees may adopt or approve. I recommend, in reference to such regulations, that it shall not be constructed upon the plan of a circulating library; and that the books shall not be allowed to be taken out of the building, except in very special cases, and in accordance with rules adapted to them as exceptional privileges."

In the spirit of this foundation, the Trustees of the Peabody and Hopkins gifts early exchanged letters of coöperation in respect to "all that could advance the cause of education, refinement and culture in our city and State." The Provost of the Peabody, Dr. N. H. Morison, referring, in 1876, to the purchase of Crelle's *Journal für Mathematik*, and other books suggested by Prof. Newcomb, which were likely to be "of great advantage to the students and professors of the higher mathematics about to assemble in Baltimore," proceeded in

these cordial words to speak of the policy of the Peabody library:

"It is proper to say that our library will be tested as never before y the body of learned men, and of students under their direction, which will be called to this city by the establishment of the Johns Hopkins University. I feel that we ought to meet their wants in the purchase of books, so far as it can be done without injury to a library which is not a technical one, but which was founded for the use of the general public. In their researches, every facility should be granted to them which is consistent with the security of the books, and their proper order and arrangement."

Without this aid from the Peabody foundation, our organization would have been very much delayed, and indeed our funds would have been seriously curtailed; for,—while there is no agency, except the living teacher, so important to a University as a large collection of books, freely accessible to those who know how to use them,—a good library is costly to purchase and costly to maintain, and is moreover of slow growth. We have, therefore, reason to be constantly grateful that the Peabody foundation so long preceded the Hopkins.

Those of our staff who are engaged in historical studies are also under great obligations to the Maryland Historical Society and its Librarian, Mr. J. W. M. Lee, who has freely opened the rich historical stores of that society to our use. The rooms of the Society have been for three years granted to us for a Historical Seminary, the members of which have greatly profited by the free access they have enjoyed to the printed sources of American history.

It is indispensable that the professors of a university who are engaged in investigation and publication, should be able to bring to their ordinary studies and laboratories certain books which are commonly bought by public libraries rather than by individuals; such for example as the publications of learned societies, the scientific works issued by governmental aid, collections of inscriptions and texts, zoölogical and other scientific plates, and books privately printed or issued in small editions. In many cases it is not enough to be allowed to consult these books in a public room;—they are of use only when studied with other appropriate aids. Such books are usually procured at a very large outlay, are of interest to but few persons, are rarely called for, and consequently remain on the library shelves untouched from one year's end to the other. There is a growing disposition among librarians to facilitate the use of such books under regulations which will prevent injury and loss. In Germany it is so common a usage as to be almost a rule, that the professors of any university may draw books from the library of any other.

So, in this country, the generous mode in which most of the large libraries are conducted, enables scholars to draw from time to time upon distant collections. It is generally acknowledged by librarians of the school of Justin Winsor, that books are most useful when they are best used; and that

libraries are not so much store-houses, to meet remote contingencies of future wants, as laboratories furnished with the best instruments now required for study. Among the distant libraries to which some of our teachers have been indebted for the loan of books, under special circumstances, are these:

The Smithsonian Institution.
The Library of Congress.
The Library of the Army Medical Museum.
The Library of the Massachusetts Historical Society.
The Royal Library of Munich.
The Library of Harvard College.
The Museum of Comparative Anatomy, Cambridge.

It is under these circumstances that our own library becomes the place for frequent consultation and for daily work. It has four departments—

(*a*) a general reference collection of books, including not only cyclopædias and dictionaries, but copies of the works of great authors, ancient and modern, in different branches of literature and science:

(*b*) several special collections of books which have been bought as the working apparatus of those departments of study now instituted among us, from lists which have been furnished by the several instructors:

(*c*) a transient collection of *new* books, English, French and German, brought here for examination as soon as published, sometimes by

purchase, and sometimes by the courtesy of dealers:

(*d*) a very full collection of current periodical literature, so selected as to supplement the lists of the Peabody, the Mercantile Library, and other reading rooms of Baltimore. A printed list of these journals, published in December, 1878, includes 579 periodicals, 251 of which are taken by the University.

Our reading room is open from 9 a. m. to 10 p. m., and is quiet and attractive. The authorities have acted in the spirit of Panizzi, who said that it was his desire to make the reading room of the British Museum so complete and so convenient that no private library, however rich the owner, would surpass it in adaptation to reference and study.

The number of books belonging to the University at this time is 7,084 bound volumes. The cost of books and periodicals, including binding, freight, &c., has been $22,031.18.

The scientific laboratories of the University are three in number. They are open throughout the day, and are fully equipped. Chemistry has a special building, constructed in 1876-7, and well arranged for about forty workers. It contains conveniences for all kinds of chemical work, separate rooms being provided for different special branches. It has a well selected library, intended

for the use of those working in the laboratory. The physical rooms are less convenient, and are indeed inadequate to the work performed in them; but they are furnished with apparatus purchased of the best European and American makers, and selected with special reference to investigations, and still more specially for researches in respect to electricity, magnetism, and heat. In these particulars, few institutions, if any, are better supplied. A list of the instruments available here and elsewhere for precise physical experiments, has lately been printed by Harvard College. The biological laboratory has a large suite of rooms occupying the entire upper story of our building, and including a general laboratory, several private work-rooms, a lecture-room and a cabinet. This also is well supplied with new and appropriate instruments. A skilful mechanician is in the constant employ of the University for the construction and repair of apparatus. The amount expended for scientific apparatus has been $27,761.00.

In the building up of collections, mineralogical, geological, botanical, zoölogical, and ethnological, the University has scarcely made a beginning. The proximity of Baltimore to Washington makes it easy for our workers to visit the collections of the capital, those of the Smithsonian Institution being particularly attractive. There is reason also

to hope that a special contribution for a museum of natural history will be made in Baltimore by some individual or by some association, so that the funds of this University may always be free from such a charge and reserved for instruction.

3. ***Investigation and Publication.*** The experience of the last three years has justified the position which was taken at the outset of the university, that opportunity should be afforded for all who are so disposed to engage in investigations in their several departments, and that they should be encouraged to publish the results at which they arrive. It was believed that learning and teaching, inquiry and instruction should never be separated. There has been no "endowment of research," no separation of the work of the investigator from that of the teacher, no attempt to enforce the consideration of scientific or literary themes, no striving after sensational effects; but simply this, a recognition of the responsibility of the teacher to be the leader of his scholars, to show them by his own methods of work how they may work, to suggest good subjects of study and to apply to their elucidation the most skilful agencies. Accordingly, as stated already, the professors have not been too much confined by appointed duties in the class rooms; and on the other hand not one of them has been freed from positive and regular appointments as a teacher.

In the appendix some indication is given of the results of this policy.

When the time for publication came, it was found that there were no journals in this country in which extended mathematical, physiological, chemical and philological papers could be promptly published, and the trustees were therefore led to encourage the establishment of journals, the pages of which are open not only to papers from members of this university but to other contributors.

The first of these serials was the American Journal of Mathematics, of which Professor Sylvester is the editor in chief, and Dr. Story the editor in charge. The coöperation of eminent mathematicians, European as well as American, was enlisted. A quarto page was adopted, and four numbers, (making a volume of about 384 pages), were promised annually. The first volume is now completed containing forty-nine communications, eleven of which were the contributions of the chief editor and seven came from other members of this University—W. E. Story, H. A. Rowland, T. Craig, G. B. Halsted, and F. Franklin. The American contributors were S. Newcomb, C. S. Peirce, J. W. Mallet, H. T. Eddy, G. W. Hill, A. W. Phillips, and others; papers were also received from A. Cayley, W. K. Clifford, and E. Frankland of England, E. Lucas of Paris, R. Lipschitz, and G. Weichhold of Germany.

The work of the Johns Hopkins Chemical Laboratory was at first reported in a series of "Chemical Notes;" twelve of which were printed. This mode of printing has been given up and in its place the American Journal of Chemistry has been begun under the editorial supervision of Professor Ira Remsen. This is printed in octavo form; six numbers a year are promised,—three of which have already appeared,—and original contributions have been received from the laboratories of Cambridge, New Haven, Cincinnati, the University of Virginia, etc.

The papers of the Biological department of this University have been communicated to journals published elsewhere, and especially to the Journal of Physiology, published in London and Cambridge, of which Professor M. Foster is one of the editors and Professor Martin an associate editor. Five papers by H. N. Martin, W. K. Brooks, I. E. Atkinson, W. D. Booker, and H. Sewall have been collected and republished under the title "Studies from the Biological Laboratory, Session of 1877-78." The scientific results of the Chesapeake Zoölogical Laboratory, in the summer of 1878, have been published in an octavo volume of 170 pages, (with several plates)—the expenses of printing being defrayed by Messrs. S. M. Shoemaker, Enoch Pratt, J. W. Garrett, J. W. McCoy, H. N. Martin, D. C. Gilman, and others.

Professor Gildersleeve has undertaken the editorial charge of a Philological Journal and has issued a prospectus, and the publication will commence in the course of another academic year.

4. ***Examinations and degrees.*** The examinations in this University are as follows:—1. for admission; 2. for matriculation; 3. for the test of progress, prior to the Baccalaureate degree; 4. for the degree of Master of Arts and Doctor of Philosophy.

The preliminary examination is informal and may be dispensed with if the candidate is ready to matriculate. Its object is to advise the scholar as to his fitness for admission. In order to become a member of the university, in full, the candidate must be matriculated. The progress of the student is tested by semi-annual examinations in which gentlemen who have not instructed the class, as well as its teachers, participate. In the examination for the Doctor's degree, stress is laid upon the thesis, which must indicate mature and well trained abilities, and the candidate is further tested by oral questioning or by written papers proposed by the Faculty.

In 1878, four persons received the Doctor's degree as stated in the last annual report.

On June 12, 1879, the following persons were admitted to the degree of Ph. Dr.:

1. MAURICE BLOOMFIELD, of Illinois, who had received the degree of A. M. from Furman University, in Greenville, S. C, at which place he was pursuing special Oriental studies, under Prof. C. H. Toy, then of the Southern Baptist Theological Seminary. He was examined in Sanskrit, Arabic, Syriac and Hebrew, and submitted a thesis, which is to be published, on the *Noun-Formation of the Rig Veda*. His attainments were certified to, not only by the resident teachers of this university, but also by Professor W. D. Whitney, of Yale College, whose pupil he was in 1877-8.

2. SAMUEL F. CLARKE, of Illinois, whose first degree was received from Yale College, where he had pursued his studies in the Sheffield Scientific School. He has been devoted to biological research, and was examined in animal morphology and embryology, animal physiology and histology, and vegetable morphology. The subjects of his theses were (1) the *Development of Amblystoma;* and (2) a report on a collection of deep sea *Hydroids from the Gulf of Mexico*, submitted to him by Prof. A. Agassiz, of the Museum of Comparative Zoölogy, Cambridge. The second of these papers has been printed in the Bulletin of that Museum for 1879.

3. GEORGE B. HALSTED, of New Jersey, who was graduated in Princeton College in 1876, and is now a tutor of mathematics in that institution. He was examined in mathematics and logic. His thesis, entitled *Basis for a Dual Logic*, was submitted to and approved by Professor Francis Bowen, professor of logic in Harvard College.

4. EDWARD HART, of Pennsylvania, received his early training in Lafayette College, where he received a degree in 1874, and is now assistant professor of chemistry. He was examined in chemistry and physics. His thesis, the result of prolonged work in the chemical laboratory, on *Nitrosulphobenzoic Acids and their Derivatives* has been printed in the Notes from the Chemical Laboratory, No. 12, and the substance of it will also appear in the American Chemical Journal.

5. WILLIAM W. JACQUES, of Massachusetts, who was graduated in the Massachusetts Institute of Technology, Boston, in 1876. His thesis on *the Distribution of Heat in the Spectra of Various Substances*, has been published by the American Academy of Arts and Sciences. He was examined in physics and chemistry.

6. HENRY SEWALL, of Maryland, was graduated as Bachelor of Science by the Wesleyan University, at Middletown in 1876. He has been engaged in the biological laboratory, and has been examined in animal physiology and histology, and also in animal morphology and vegetable physiology. He submitted a thesis on the *Development and Regeneration of the Gastric Glandular Epithelium during fœtal life and after birth*, which has been published in the Journal of Physiology, London, Vol. IV, No. I; and also a paper on the *Physiology of Tetanus*, which is to appear in an early number of the same Journal. In his examination, Dr. H. P. Bowditch, professor of physiology in Harvard College, took part.

On the same date the following persons were admitted to the degree of Bachelor of Arts, viz:

1. GEORGE W. MCCREARY, of Baltimore, who was graduated at the City College in 1874, and has successfully completed a course of classical studies, as well as courses in physics, French and German.

2. A. CHASE PALMER, of Baltimore, who received his early training under Rev. Dr. Dalrymple, and was afterwards a member of Princeton College. He has pursued a course of classical and historical studies, and the major course in German, and has also, for a year and a half, worked with success in the chemical laboratory.

3. EDWARD H SPIEKER, who finished the course at the City College, in 1877, and has since pursued a course of classical studies, together with French and German, and a course in physics extending through one year.

5. ***Public Lectures.*** In order to extend the educational influence of the University, courses of Lectures have been opened to the public on certain conditions,—the tickets being gratuitously distributed first to members of the University, then to teachers and special students of the subjects announced, and next to gentlemen and ladies in the order of application. The teachers of the public and private schools have, in large numbers, attended some of these courses. In the following list the subjects, the number of lectures, and the average number of hearers, are given. Many of the names of the lecturers will be recognized as those of professors in other colleges, to whose coöperation this University is greatly indebted. Other courses have been given by the staff of the Johns Hopkins University, including Fellows who have, from time to time, volunteered to lecture upon subjects to which they had given particular

attention. The attendance of students has been voluntary. The lectures have been of an academic and not of a popular character, and yet they are regarded as supplementary and not as essential to the regular courses of instruction. By a residence among us of two or three years, a student, while rigidly pursuing his chosen studies, may have the opportunity of listening to able teachers in different branches of literature and science, on some aspects of their work which are of general interest.

SUMMARY OF THE PRINCIPAL COURSES OF PUBLIC LECTURES, 1876–9, (*not including many annual courses in Chemistry, Physics, Mathematics, Biology, Languages and Literature to which the public are not invited*):

	Average Attendance.
ADAMS, H. B., (Associate.)	
Religion and Government in the Ancient World, (2),	19
Beginnings of Church and State, (10),	83
ALLEN, W. F., (Prof. Univ. of Wisc.)	
History of the Fourteenth Century, (20),	96
BILLINGS, J. S., (U. S. Surg. Genl's Office.)	
History of Medicine, etc., (20),	49
BRANDT, H. C. G., (Associate.)	
German Literature prior to the Classical Period, (9),	42
BROOKS, W. K., (Associate.)	
Theories of Biology, (16),	30
CHILD, F. J., (Prof. Harv. Univ.)	
Chaucer, (20),	191
Ballads of England and Scotland, (20),	137
Shakespeare's Plays: Hamlet, Macbeth, (10),	195
COOLEY, T. M., (Prof. Univ. of Mich.)	
Torts, (20),	87
Recent Amendments to the Constitution of the United States, (6),	103
Evils in Local Government, (6),	87

	Average Attendance.
Cr- M., (Associate.)	
] *I* ..e New Testament, (10), ...	12
DIMAN, J. L., (Prof. Brown Univ.)	
Thirty Years' War, (20), ...	192
ELLIOTT, A. M , (Associate.)	
Dante, (10), ...	152
FARLOW, W. G., (Prof. Harv. Univ.)	
Selected Botanical Subjects, (6), ...	89
GILDERSLEEVE, B L., (Professor.)	
Greek Lyric Poetry, (20), ...	42
Homer's Odyssey, (20), ...	153
Introductory to Greek Prose Literature, (12), . . .	30
HALSTED, G. B., (Fellow.)	
Clear Thinking and its Best Modern Methods, (5), . .	61
HASTINGS, C. S., (Associate.)	
Theory of Sound in its Relation to Music, (6), . . .	162
HILGARD, J. E., (U. S. Coast Survey.)	
Territorial Surveys, (20), ...	21
JAMES, W., (Prof. Harv. Univ.)	
The Senses and the Brain and their Relation to Thought, (10),	62
LOWELL, J. R., (Prof. Harv. Univ.)	
Dante, (20), ...	179
MALLET, J. W., (Prof. Univ. of Va.)	
Waste Products of Chemical Manufacture, (20), . . .	29
History of the Chief Branches of Chemical Industry, (20), .	45
MARTIN, H. N., (Professor.)	
General Biology, (20), ...	66
MEANS, D. McG., (Fellow.)	
The Political Situation in Eastern Europe, (4), . . .	70
Political Economy in the United States, (4), ...	15
MORRIS, G. S., (Prof. Univ. of Mich.)	
General History of Philosophy, (20), ...	124
Topics, Historical and Practical, in Ethics, (14), . . .	123
MURRAY, T. C., (Associate.)	
The Hebrew Scriptures, (9), ...	41
NEWCOMB, S., (U. S. N. Observ.)	
History of Astronomy, (20), ...	50
RABILLON, L., (Resident Lecturer.)	
History of the Formation of the French Language, (19), .	20
History and Evolution of the French Language, (20), . .	48
French Romantic Literature, (11), ...	35
REMSEN, I., (Professor.)	
History of Chemistry, (12), ...	111

	Average Attendance.
ROYCE, J., (Fellow.)	
Studies on the "Return to Kant," (5),	18
Poetry of the German Romantic School, (8),	33
SAVAGE, A. D., (Fellow.)	
Cyprus and Mycenæ, (8),	81
SCOTT, A., (Associate.)	
English History, (12),	37
SIHLER, E. G., (Fellow.)	
History of Greece in the 5th Century, B. C., (10),	39
Attic Life and Society, (3),	30
VON HOLST, H., (Prof. Univ. of Freiburg.)	
The German Empire, (10),	258
WALKER, F. A., (Prof. Yale College.)	
Money, (20).	49
Finance, (21),	44
WHITNEY, W. D., (Prof. Yale College.)	
Historical Development of the Inflective Structure of the Indo-European Languages, (18),	84

Less public in their character are certain courses of lectures which have been given to specialists by the teachers of the University. During the last winter Dr. Martin gave a weekly series of physiological demonstrations to the professors and students of the medical schools of Baltimore, the number of attendants being 25. Dr. Hastings, at the request of gentlemen in Washington devoted to astronomical science, gave four lectures in the Smithsonian Institution, to a company of 15 hearers, on the Mathematical Theory of the Telescope, embodying some original views of his own. Dr. T. Craig lectured to a small company chiefly consisting of civil and military engineers resident in Baltimore, on questions in hydrodynamics.

6. ***Teachers' Class in Zoölogy.*** Two courses of biological lessons, with laboratory work, designed exclusively for teachers, have been given in successive winters; the first by Professor Martin in 1877-8, on Animal Physiology, and the second in 1878-9 by Dr. Brooks on Elementary Zoölogy. An account of the class first named is given in the University Report for 1878;—an account of the second, by Dr. Brooks, is here inserted.

In conducting the Teachers' Class in Zoölogy, the plan pursued by Dr. Martin with the Teachers' Class in Physiology during the previous winter, was adopted as far as the nature of the subject permitted.

The public announcement of the course stated that "the class would be limited to school teachers or students of a Normal College who are engaged in teaching, or who purpose to teach," and in order to allow time for each student to receive personal help from the instructors, the class was limited to fifteen persons.

The following persons attended the course, all teachers in Baltimore and its vicinity, but not all teaching natural science:

Miss Emma Cowman,	Dr. C. F. Percival,	Mr. G. L. Smith,
Mr. H. Gordon,	Mr. E. H. Reade,	Miss M. B. Smyth,
Miss Isabella Hampson,	Mr Arthur Resler,	Mr. B. Sollers,
Rev. J. G. Morris,	Mr. Aug. Schmidt,	Mr. J. W. Wilson,
Miss I. J. McNeal,	Miss Scott,	Miss E. A. Yarnall.

The aim of the course was to supply at first hand, by the study of typical forms of animal life, such an acquaintance with the principles of Morphology as would be of use in teaching any branch of natural science, and the furnishing of facts, to be retailed to classes, was made a very subordinate object.

For this reason I did not attempt to restrict the course to animals which could be procured for class work, although common forms were used as far as possible.

The course of instruction included fifteen one-hour lectures and forty-five hours of laboratory work, on the mornings of fifteen Saturdays.

A series of typical forms of animal life was selected, and a descriptive lecture, illustrated by diagrams, black-board drawings and specimens, was given upon each one of them. Each student was then supplied with one or more specimens of the same animal, and with a printed sheet of directions for studying it. This paper enumerated the points to be noticed, in the order in which they are best studied, and gave directions for handling and dissecting the specimens.

Each student was also provided with the necessary dissecting apparatus; with a very simple and effective dissecting microscope designed for the purpose by Dr. Clarke, and with a compound microscope.

The following is a list of the animals which were studied:

Protozoa: Amœba, Vorticella, Paramœcium.
Cœlenterata: Fresh-water Hydra, Calcareous Sponge.
Echinoderms: Star Fish, Sea Urchin.
Annelids: Earth worm, Leech.
Arthropods: Cray Fish, Common Crab, Grasshopper.
Mollusca: Fresh-water Mussel, Oyster, Squid.

It was intended to include four vertebrates, but the above animals occupied the whole fifteen weeks.

Copies of the laboratory directions were sent to other persons engaged in similar teaching They were used by Prof. Hyatt in the instruction to teachers given by the Boston Society of Natural History. They are used this year by Prof. Faxon in the instruction to under-graduates at the Museum of Comparative Zoölogy of Harvard College, and there have been numerous applications for them from other places.

The assistance given me by Dr. Clarke was of great value, as one person could hardly have superintended the work in the laboratory.

7. ***The Chesapeake Zoölogical Laboratory.*** This organization, under Dr. Brooks, has held its second session during the summer of 1879—attended by a select company of advanced students of zoölogy. The results of the season will soon be printed in an extended form; meanwhile, the summary given in the appendix may be read with interest. It will be noticed that the Engineer Corps of the U. S. Army, the Smithsonian Institution, the U. S. Fish Commission, and the Maryland Fish Commission, have coöperated in this work with the Johns Hopkins University.

8. ***Instruction Preliminary to Medical Studies.*** Much attention has been bestowed during the year upon the subject of a course of studies antecedent

to the study of medicine. In addition to the suggestions received from able members of the profession in this country, the Trustees have been favored with written communications from a number of eminent British surgeons, namely:

ROBERT BENTLEY, M. R. C. S., *London*, Dean of the Medical Faculty of Kings College.

G. W. CALLENDER, F. R. S., *London*, Lecturer on Surgery at St. Bartholomew's Hospital.

MICHAEL FOSTER, F. R. S., *Cambridge*, Praelector of Physiology at Trinity College.

CHRISTOPHER HEATH, F. R. C. S., *London*, Professor of Clinical Surgery at University College.

TIMOTHY HOLMES, F. R. C. S., *London*, Lecturer on Surgery at St. George's Hospital.

T. H. HUXLEY, Sec. R. S., *London*, Professor of Natural History at the Royal School of Mines.

SIR JAMES PAGET, Bart., F. R. S., *London*, President of Royal Medical Chirurgical Society.

GEORGE ROLLESTON, F. R. S., *Oxford*, Professor of Anatomy at the University of Oxford.

J. B. SANDERSON, F. R. S., *London*, Professor of Physiology at University College.

W. S. SAVORY, F. R. S., *London*, Lecturer on Surgery at St. Bartholomew's Hospital.

WILLIAM STOKES, F. R. S., *Dublin*, Professor of Physiology at the University of Dublin.

WILLIAM TURNER, F. R. C. S., *Edinburgh*, Professor of Anatomy at the University of Edinburgh.*

The views of these gentlemen were in the main unanimous, (although they were not in consultation with one another), and confirmed the Trustees in respect to the wisdom of the courses projected. The essentials of our scheme, which are explained

*Subsequently, DR. ACLAND, Regius Professor of Medicine in the University of Oxford, visited Baltimore and gave in writing his recommendations, which are about to be printed.

in the Register, include prolonged studies in Physics, Chemistry, and Biology, with ample practice in laboratories. This course can only be followed by those who have matriculated or graduated, or by a special examination have satisfied the authorities that they are sufficiently good scholars to profit by the advantages here offered. The study of English, French, German, Latin, and, if the candidate desires it, Greek, may be prosecuted in connection with scientific work,—and so of other literary subjects.

9. ***Personal Changes.*** Death has removed from the number of instructors Mr. Thomas C. Murray, an Associate Professor in the department of Shemitic languages. He died March 20, 1879, at the age of 29 years, shortly after completing a course of public lectures on the interpretation of the Hebrew Scriptures, which are soon to be published as a memorial of his life and attainments.

Mr. Murray was one of the persons earliest connected with our academic staff. For a considerable time he acted as librarian, and, to the close of his life, was active in promoting the interests of the library. He was an accurate and learned scholar, a diligent and successful teacher, and a man who lived in accordance with the highest ideal of a Christian life.

By the appointment of the Trustees, Mr. Minton Warren, Ph. D., of the University of Strasburg,

and Mr. A. S. Cook, a graduate of Rutgers College, have been made Associates, the former in Latin and the latter in English. Professor G. S. Morris has been chosen Lecturer in the History of Philosophy and in Ethics; Professor C. S. Peirce, in Logic; Professor J. W. Gibbs, in Theoretical Mechanics; and Mr. Sidney Lanier, in English Literature.

The post of Librarian, vacated by the resignation of Mr. Arthur W. Tyler, now in charge of the Public Library at Indianapolis, was temporarily filled by Mr. A. D. Savage. At the beginning of the new academic year, Dr. William Hand Browne, of Baltimore, assumes the position to which he was chosen by the Board of Trustees.

The following summary indicates the number of Students enrolled during the last three years:

	Graduates, including Fellows.	Matriculates.	Non-Matriculates.	Total.
1876–77, ...	54	12	23	89
1877–78, ...	58	24	22	104
1878–79, ...	63	25	35	123
*1879–80, ...	67	31	42	140

The following statement shows the number of persons, (in addition to enrolled Students) who have followed special, not public courses, during the past year:

Teachers attending a special class in Zoölogy, ...	15
Medical Students attending Demonstrations in Animal Physiology, .	25
Medical Students attending a Course in Animal Histology, . .	12

*At the opening of the fourth year.

Persons attending a Course in Hydrodynamics, ... 8
Persons attending a Course on the Theory of the Telescope, . . 15
Persons attending the Chesapeake Zoölogical Laboratory, . . 10

10. ***Public Assemblies.*** The twenty-second of February has been observed as the anniversary of the institution, with the following exercises:

1876. Addresses by REVERDY JOHNSON, JR., Esq., President C. W. ELIOT, of Harvard, and an Inaugural by the President of the Johns Hopkins University.
1877. Addresses by Professors SYLVESTER and GILDERSLEEVE, and the reading of a Poem by Professor JAS. RUSSELL LOWELL.
1878. Addresses by Judge GEO. WM. BROWN, Professor REMSEN and President ELIOT, of Harvard College.
1879. Address by Hon. A. D. WHITE, President of Cornell University, and an official Statement by Judge GEO. W. DOBBIN, of the Board of Trustees.

The address of President White in 1879 was an elaborate defence and exposition of the importance of university studies in Historical and Political Science. It was printed and widely distributed.

At the close of President White's address, a company of some 230 college graduates, resident in Baltimore, with the Governor of the State, the Mayor of the city, the Trustees of Johns Hopkins University, and a few invited guests, assembled in the smaller Concert Room of the Academy of Music, and partook of a collation, after which short speeches were made by the presiding officer, Hon. S. T. Wallis, LL. D., Provost of the University of Maryland, President White, Professor Von Holst, (the author of a constitutional history of the United States, who had recently completed a course

of lectures in Baltimore,) Professor Sylvester, Charles Marshall, Esq., of the Baltimore Bar, and Rev. Dr. Leeds, of Grace Church.

Degrees were conferred near the close of the academic year, in the presence of the officers and students and their personal friends.

The University has had the pleasure of receiving many visitors within the past three years, including several scientific and literary associations,—the American Philological Association, the American Institute of Mining Engineers, the Medical and Chirurgical Society of Maryland, the Teachers' Association of Baltimore County, and the College delegates of the Y. M. C. Association. Among the visits of individuals received within the past year, it is particularly pleasant to recall that of Dean Stanley, of Westminster, and his friends, who were here at the opening of our academic work in September, 1878.

Several members of the Faculty (B. L. Gildersleeve, C. S. Hastings, H. B. Adams, and D. C. Gilman) united in giving a course of lectures at the McDonogh School, to the pupils of that foundation, during the winter of 1878–9; and Professor Remsen gave a course of four lectures to mechanics and others in the room of the Academy of Sciences,—his subject being Elementary Chemistry. Dr. Martin gave a lecture before the County teacher's association, on Animal Mechanics, as an

example of how to teach Physiology in schools. Before the Medical and Chirurgical Faculty of Maryland, the annual address was given in 1878, by Professor Remsen, on Chemistry in its relations to Medicine, and in 1879, by Professor Martin, on the Physiology of Secretion.

11. ***Conclusion.*** In closing this record of the work of three years, I am confident that I express the sentiments of both the governing boards, the Trustees and the Faculty, in adding that we have had increasing reason for confidence and hope. The good will extended toward this foundation by the citizens of Baltimore and by its daily press, as well as by the leaders of educational affairs in different parts of this country, has been remarkable. The number of students constantly increases and their quality constantly improves. There has not been an occasion for the Faculty to reprimand or censure a single student. It is understood that devotion to study, and responsibility to duty are absolutely required of all the members of the University, and that those who are not willing or able to conform to this requirement, are expected to withdraw. It has never been my good fortune to live among a more earnest, diligent, and enthusiastic company of young men than those who are here assembled.

An institution like this, established without ecclesiastical or denominational support, is liable to be misunderstood and misinterpreted,—sometimes even by its very best friends. We have not been free from animadversions; but the authorities have preferred to say nothing in recrimination and but little in self-defence.

The character, aim, and influence of the University foundation must be discovered in the conduct and utterances of those who administer its affairs, and by its dominant efforts through a course of years. Fortunate will it be if teachers and pupils are uniformly found on the side of righteousness and truth; if the voice of the University is never heard in the defence of error, falsehood or pretence; and if all who administer its affairs are reverent toward God and faithful toward man. Such an institution, by unfolding the laws of nature, by discovering principles hitherto hidden, by interpreting history, and by strengthening the foundations of intellectual, moral and religious character, will deserve the support of all good men, under whatever ecclesiastical banner they may choose to be enrolled.

Respectfully submitted,

D. C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, *September 1, 1879.*

APPENDIX.

A.

Academic Staff.

PRESIDENT.

Appointed
Dec. 30, 1874. DANIEL C. GILMAN.

PROFESSORS.

Jan. 3, 1876. BASIL L. GILDERSLEEVE, *Greek.*
Mar. 5, 1876. J. J. SYLVESTER, . . *Mathematics.*
April 17, 1876. IRA REMSEN, . . . *Chemistry.*
April 17, 1876. HENRY A. ROWLAND, . *Physics.*
Sept. 4, 1876. H. NEWELL MARTIN, . *Biology.*
Sept. 4, 1876. CHARLES D. MORRIS, . *Classics.*

ASSOCIATES.

April 3, 1876. JOHN M. CROSS, . . *Greek.*
April 3, 1876. PHILIP R. UHLER, . . *Natural History.*
April 17, 1876. AUSTIN SCOTT, . . *History.*
June 5, 1876. A. MARSHALL ELLIOTT, *Modern Philology.*
June 5, 1876. THOMAS C. MURRAY, . *Shemitic.* *1879.*
Sept. 4, 1876. HERMAN C. G. BRANDT, . *German.*
Sept. 4, 1876. WILLIAM K. BROOKS, . *Biology.*
Sept. 4, 1876. HARMON N. MORSE, . *Chemistry.*
Sept. 4, 1876. ROBERT RIDGWAY, . . *Natural History.* *1877.*
Sept. 4, 1876. WILLIAM E. STORY, . *Mathematics.*
Sept. 4, 1876. ARTHUR W. TYLER, . *Librarian.* *1878*
Oct. 2, 1876. CHARLES S. HASTINGS, . *Physics.*
May 7, 1877. CHARLES R. LANMAN, . *Sanskrit.*
June 3, 1878. HERBERT B. ADAMS, . *History.*
June 12, 1879. ALBERT S. COOK, . . *English.*
June 12, 1879. MINTON WARREN, . . *Latin.*
July 7, 1879. WILLIAM HAND BROWNE, *Librarian.*

LECTURERS.

Appointed			Courses.
1876.	JOHN S. BILLINGS,	*Medical History, etc.*	One.
1876.	FRANCIS J. CHILD,	*Early English, etc.*	Three.
1876.	THOMAS M. COOLEY,	*Law.*	Three.
1876.	JULIUS E. HILGARD,	*Geodetic Surveys.*	One.
1876.	JAMES RUSSELL LOWELL,	*Romance Literature.*	One.
1876.	JOHN W. MALLET,	*Technological Chemistry.*	Two.
1876.	SIMON NEWCOMB,	*Astronomy.*	One.
1876.	LÉONCE RABILLON,	*French.*	Three.
1876.	FRANCIS A. WALKER,	*Political Economy.*	Two.
1876.	WILLIAM D. WHITNEY,	*Comparative Philology.*	One.
1877.	WILLIAM F. ALLEN,	*History.*	One.
1878.	WILLIAM JAMES,	*Psychology.*	One.
1878.	GEORGE S. MORRIS,	*Philosophy.*	Two.
1878.	J. LEWIS DIMAN,	*History.*	One.
1878.	H. VON HOLST,	*History.*	One.
1878.	WILLIAM G. FARLOW,	*Botany.*	One.
1879.	J. WILLARD GIBBS,	*Theoretical Mechanics.*	
1879.	SIDNEY LANIER,	*English Literature.*	
1879.	CHARLES S. PEIRCE,	*Logic.*	

ASSISTANTS.

1876.	HENRY SEWALL,	*Biological Laboratory. 1878.*
1879.	SAMUEL F. CLARKE,	*Biological Laboratory.*
1879.	FABIAN FRANKLIN,	*Mathematics.*
1879.	LYMAN B. HALL,	*Chemical Laboratory.*
1879.	CHRISTIAN SIHLER,	*Biological Laboratory.*

FELLOWS.

1. HENRY CARTER ADAMS (*Political Science, 1876–79*), from Waterloo, Iowa; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; *Lecturer upon Finance at Cornell University, Ithaca, N. Y., 1879–80.*

History of Taxation in the United States, (*Graduating thesis, J. H. U., 1878*), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789–1816. (*Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen, 1879.*)

Coöperation. (*Am. Soc. Sc. Assoc., 1878.*)

Historical Position of Socialism in the Development of Political Economy. (*Penn Monthly, 1879.*)

2. HERBERT BAXTER ADAMS (*History, 1876-78*), from Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872-73; Student of History and Political Science at

Heidelberg, and Berlin, 1873-76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878-80; *Associate in History, 1878-80.*

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Historical Society, 1877.*)

3. WILLIAM KEITH BROOKS (*Biology, 1876*), from Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874-75; *Associate in Biology, 1876-80.*

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (*Proc. Amer. Assoc., 1874.*)
Embryology of the Fresh-Water Mussel. (*Proc. Amer. Assoc., 1875.*)
Embryology of Salpa. (*Proc. Boston Soc. Nat. Hist., 1875.*)
The Affinity of the Mollusca and the Molluscoida. (*Proc. Boston Soc. Nat. Hist., 1875.*)
The Development of Salpa. (*Bull., Mus. Comp. Zoöl., Cambridge, No. 14.*)
A Remarkable Life-History. (*Amer. Nat., Nov., 1876.*)
A Provisional Hypothesis of Pangenesis. (*Amer. Nat., March, 1877.*)
Parthenogenesis in Vertebrates and Molluscs. (*Amer. Nat., Oct., 1877.*)
Preliminary Observations upon the Development of the Marine Prosobranchiate Gasteropods. (*Studies from the Biol. Lab., J. H. U., 1879.*)
The Development of Lingula and the Systematic Position of the Branchiopods. (*Scientific Results, Chesapeake Zoöl. Lab., 1879.*)
The Larval Stages of Squilla empusa. (*Scientific Results, Chesapeake Zoöl. Lab , 1879.*)

4. THOMAS CRAIG (*Mathematics, 1876–78; Physics, 1878–79*), from Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878; *Tidal Division, U. S. Coast and Geodetic Survey, 1879–80.*

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (*Graduating Thesis, J. H. U., 1878.*)
Motion of a Point upon the Surface of an Ellipsoid. (*Am. Jour. of Math., 1878.*)
Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng. Mag., 1879.*)
Motion of a Solid in a Fluid. (*Am. Jour. of Math., 1879.*)
General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst., 1879.*)
Treatise on the Mathematical Theory of Projections. (*U. S. Coast Survey, 1879.*)
Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math., 1879.*)
Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math., 1879.*)

5. JOSHUA WALKER GORE (*Mathematics, 1876–78*), from Frederick County, Virginia; C. E., University of Virginia, 1875; *Professor of Natural Science, Southwestern Baptist University, Jackson, Tenn., 1878–80.*

6. GEORGE BRUCE HALSTED (*Mathematics, 1876–78*), from New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875–76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; *Tutor in Princeton College, 1878–80.*

Basis for a Dual Logic. (*Graduating Thesis, J. H. U., 1879.*)
Spencer's Classification of the Abstract Sciences. (*Popul. Sc. Mon., 1877.*)
The New Ideas about Space. (*Popul. Sc. Mon., 1877.*)
Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math., 1878–79.*)
Note on the First English Euclid. (*Am. Jour. of Math., 1879.*)
Historical Sketch of Exact Rectilinear Motion. (*Van Nostrand's Eng. Mag., 1878.*)
Mechanical Conversion of Motion. (*Van Nostrand's Eng. Mag., 1878; reprinted in "World of Science," London.*)
Jevons's Criticism of Boole's Logic. (*Mind, 1878.*)
Boole's Logical Method. (*Jour. of Spec. Philos., 1878.*)
Statement and Reduction of Syllogism. (*Jour. of Spec. Philos., 1878.*)
Algorithmic Division in Logic. (*Jour. of Spec. Philos., 1879.*)

7. EDWARD HART (*Chemistry, 1876–78*), from Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; *Assistant Professor in Chemistry, Lafayette College, 1878–80.*

Nitrosulphobenzoic Acids and their Derivatives. (*Graduating thesis, J. H. U., 1879; notes from Chem. Lab., J. H. U., 1878.*)
Volumetric Estimation of Sulphuric Acid. (*American Chemist, VI, 284.*)
Volumetric Estimation of Iron. (*Chem. News, XXXIV, p. 65.*)
Ueber Isomere Sulfosäuren aus Paranitrotoluene. (*Ber. d. Deut. Chem. Ges., X, 1046; notes from Chem. Lab., J. H. U., 1877.*)
Handbook of Volumetric Analysis. (*N. Y. Wiley, 1878.*)
Stopcock of Easy Construction. (*Am. Chem. Jour., 1879.*)

8. DANIEL WEBSTER HERING (*Engineering, 1876–78*), from Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873–74; C. E., Yale, 1878; *Assistant Engineer, Baltimore and Cumberland Valley Railroad, Waynesboro', Pa., 1878–80.*

9. MALVERN WELLS ILES (*Chemistry, 1876–78*), from Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1876; *Chemist, Leadville, Colorado.*

A New Qualitative Reaction for Boracic Acid. (*Am. Chemist, 1876.*)
On the Action of Ozone upon Milk. (*Sc. Amer., 1877.*)
On the Oxidation of Sulpho-Acids derived from Metaxylene. (*Notes from Chem. Lab., J. H. U., 1877.*)
On the Oxidation of Xylenesulphonic Acids. (*Notes from Chem. Lab., J. H. U., 1877–78.*)
A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., 1878.*)

10. WILLIAM WHITE JACQUES (*Physics, 1876–79*), from Newburyport, Mass.; S. B., Mass. Institute of Technology 1876; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy and Resident Student, 1879–80.*

Light Transmitted by One or More Plates of Glass. (*Am. Acad., 1875.*)
Answer to M. Jamin's Objections to Ampère's Theory. (*Am. Acad., 1875.*)
Diffraction of Sound. (*Am. Acad., 1876.*)
An Experimental Proof of the Law of Inverse Squares for Sound. (*Am. Acad., 1876.*)
Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. Franklin Inst., 1878.*)
Velocity of Very Loud Sounds. (*Am. Jour. of Science, 1879.*)
Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (*Am. Jour. of Science, 1879.*)
Distribution of Heat in the Spectra of Various Sources of Radiation. (*Graduating thesis, J. H. U., 1879; Am. Acad., 1879.*)

11. CHARLES ROCKWELL LANMAN (*Sanskrit, 1876–77*), from Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873–74; Tübingen, 1874–75; Leipzig, 1875–76; Secretary and Curator of the American Philological Association, 1879–80; *Associate for Sanskrit, 1877–80.*

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (*Leipzig, 1873–75.*)
Compendium of Sanskrit Paradigms. (1876.)
A Conjectural Emendation of Rig-Veda i. 30. 11. (*Am Or. Soc. Proc., 1877.*)
On Tentative Linguistic Forms. (*Am. Or. Soc. Proc., 1878.*)
Noun-Inflection in the Veda. (*Am. Or. Soc. Jour., Vol. X., pp. 325–615.*)

12. DAVID MCGREGOR MEANS (*Political Science, 1876–77*), from Andover, Mass.; A. B., Yale, 1868; *Professor of Political and Mental Science in Middlebury College, Vermont.*

13. HARMON NORTHRUP MORSE (*Chemistry, 1876*), from Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875–76; *Associate in Chemistry, 1876–80.*

Benzoylamidophenols. (*Ber. d. Deut. Chem. Ges., 1874.*)
Ueber Einige Derivate des Ortho- und Paramidophenols. (*Inaug. Dissertation, Göttingen, 1875.*)
On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (*Notes from Chem. Lab., J. H. U., 1877.*)
On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (*Notes from Chem. Lab., J. H. U., 1877.*)

14. WALTER HINES PAGE (*Greek, 1876–78*), from Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875–76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878–79; *Cary, N. C.*

15. P. PORTER POINIER (*Physics, 1876*), from Newark, N. J.; M. E., Stevens Inst., 1874. *Died, without entering upon the Fellowship, June, 1876, aged 23 years.*

Formulæ for the Apparent Specific Heat of Saturated Vapors. (*Jour. Frank. Inst., 1875.*)

16. ERASMUS DARWIN PRESTON (*Engineering, 1876–78*), from Spruce Grove, Pa.; B. C. E., Cornell, 1875; Assistant Engineer Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875–76; *Aid, United States Coast Survey, 1878–80.*

17. HENRY JOSEPH RICE (*Biology, 1876–78*), from Cazenovia, N. Y.; S. B., Cornell, 1876; *Assistant, U. S. Fish Commission, 1879.*

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, Osmerus eperlanus. (*Md. Fish Commission, 1878.*)
Notes upon the Development of the Shad, Alosa sapidissima. (*Md. Fish Commission, 1878.*)

18. JOSIAH ROYCE (*Philosophy, 1876–78*), from Oakland, Cal.; A. B., Univ. of California, 1875; Ph. D., Johns Hopkins, 1878; *Assistant Professor of Literature in the University of California, Berkeley, Cal.*

Interdependence of the Principles of Human Knowledge. (*Graduating thesis, J. H. U., 1878.*)

19. ERNEST GOTTLIEB SIHLER (*Greek, 1876–79*), from Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classic Philology at Berlin and Leipsic, 1872–75; Ph. D., Johns Hopkins, 1878; *Classical Instructor in Dr. J. Sachs' Collegiate Institute, New York City, 1879–80.*

Plato's Use of Metaphor and Comparison. (*Graduating thesis, J. H. U., 1878.*)
Herodotus, Æschylus and the Battle of Salamis. (*Am. Philol. Assoc., 1877.*)
The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Am. Philol. Assoc., 1879.*)

20. FREDERICK BOYD VAN VORST (*Ethics and Metaphysics, 1876–77*), from New York City; A. B., Princeton, 1875; Fellow

in Metaphysics in Princeton College, 1875–76; *Attorney-at-Law, New York City.*

21. JOHN HENRY WHEELER (*Philology, 1876–77*), from Auburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow in Classics of Harvard College, 1877; Student at Leipsic, and Bonn, 1877–78; Ph. D., Bonn, 1879.

De Alcestidis et Hippolyti Euripidearum Interpolationibus. (*Doctor's dissertation, printed at Bonn, 1879.*)

22. SAMUEL FESSENDEN CLARKE (*Biology, 1876–79*), from Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874–75; Assistant in Zoölogy in Sheffield Scientific School, 1874–76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; *Assistant in Biological Laboratory, 1879–80.*

New and Rare Species of Hydroids from the New England Coast. (*Conn. Acad., 1875.*)
New Hydroids of the Pacific Coast of the U. S., South of Vancouver Island. (*Conn. Acad., 1876.*)
Hydroids of Alaska. (*Acad. Nat. Sc., Phila., 1876; Smithsonian Institution, 1876.*)
Hydroids of the Gulf Stream and Gulf of Mexico. (*Mus. Comp. Zoöl., Camb., Mass., 1879.*)
Development of Amblystoma punctatum, Baird. (*Biol. Lab., J. H. U., 1879.*)

23. LYMAN BEECHER HALL (*Chemistry, 1877–79*), from New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; *Assistant in Chemical Laboratory, 1879–80.*

Ueber Orthonitrosalicysäure und einige Abkömmlinge derselben. (*Inaugural Dissertation, Göttingen, 1875.*)
On the Oxidation of Mesitylene-Sulphonic Acid (*Notes from Chem. Lab., J. H. U., 1877; Ber. d. Deut. Chem. Ges., X.*)
On the Oxidation of Substitution Products of Mesitylene. (*Notes from Chem. Lab., J. H. U., 1878.*)
Ueber Oxidationsprodukte aus Cymosulfamid. (*Ber. d. Deut. Chem. Ges., XII.*)

24. ALEXANDER DUNCAN SAVAGE (*Greek, 1876–79*), from Pass Christian, Miss.; B. Litt., University of Virginia, 1870; A. M., Yale, 1877; *Assistant of the Director of the Metropolitan Museum of Art in New York, 1879–80.*

The "Oath of Rhadamanthus." (*Am. Philol. Assoc., 1878.*)
Discussion of the Periods to which the Egyptian and Assyrian Statues of Ancient Cyprus shall be assigned. (*Metropolitan Museum, N. Y., 1879.*)

25. FABIAN FRANKLIN (*Mathematics, 1877–79*), from Baltimore, Md.; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870–71; City Surveyor's Office, Baltimore, 1871–77; *Assistant in Mathematics, 1879–80.*

Bipunctual Coördinates. (*Amer. Jour. of Math., 1878.*)
Notes on Partitions of Numbers, etc. (*Am. Jour. of Math., 1878; 1879.*)

26. CHRISTIAN SIHLER (*Biology, 1877–79*), from Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; *Assistant in Biological Laboratory, 1879–80.*

On the so-called Heat-Dyspnœa. (*Jour. of Physiol., 1879.*)

27. FRANCIS GREENLEAF ALLINSON (*Greek and Sanskrit, 1877–80*), from Burlington, N. J.; A. B., Haverford, 1876, and

A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878.

28. MAURICE BLOOMFIELD (*Sanskrit and Greek, 1878–79*), from Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy, Johns Hopkins University, and Student of Philology at Vienna, 1879–80.*

Noun-Formation of Rig Veda. (*Graduating Thesis, J. H. U., 1879.*)

29. CONSTANTINE FAHLBERG (*Chemistry, 1878–80*), from Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874–75; Analytical and Consulting Chemist, New York City, 1875–76; Assistant in Dr. Halse's Technological Laboratory, London, 1876–77; Chemist of the Colonial Company, London and Demerara (South America), 1877–78.

Determination of Calcium Monosulphide in Boneblack. (*Zeitsch f. analyt. chem. 1871.*)
On Oxyacetic Acid. (*Dissertation, Leipsic, 1873; Kolbe's Jour., 1873.*)
New Method for the Volumetric Estimation of Zinc. (*Zeitsch. f. analyt. chem., 1875.*)
Description of the Manufacture of Cane Sugar in Demerara. (*Royal Gazette, 1877.*)
Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (*U. S. Patent Office, 1878.*)
A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U., 1878.*)
On the Oxidation of Tolueneorthosulphamide. (*Ber. d. Deut. Chem. Ges., 1878.*)
On the Liquid Toluenesulphochloride. (*Am. Chem. Jour, 1879.*)

30. EDWIN HERBERT HALL (*Physics, 1878–80*), from Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics at Johns Hopkins University, 1877–78.

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math., 1879.*)

31. EDWARD COLES HARDING (*Greek, 1878–79*), from Northumberland County, Va.; A. M., University of Virginia, 1876; *Lottsburg, Northumberland County, Virginia.*

32. ISAAC OTT (*Biology, 1878–79*), from Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876–77; A. M., Lafayette, 1877; *Physician, Easton, Pa.*

Cocain, Veratria and Gelsemium. (*Phila., 1874.*)
Rapidity of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Katelectrotonus. (*Jour. of Nervous and Mental Diseases.*)
The Action of Medicine. (*Phila., Lindsay, 1868.*)
Sweat-Centres. The Action of Muscarin and Atropin on them. (*Jour. of Physiol., 1878.*)
Observations on the Spinal Cord. (*Biol Lab., J. H. U.; Jour. of Physiol., 1879.*)

Also a large number of minor contributions to Phila. Med. Times; Boston Med. Journal; Jour. of Nerv. and Ment. Diseases, etc.

33. HENRY SEWALL (*Biology, 1878–79*), from Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, at Johns Hopkins University, 1876–78; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy, Johns Hopkins University, and Student of Biology, at Leipsic, 1879–80.*

Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Jour. of Physiol., 1878.*)
On the effect of Two Succeeding Stimuli upon Muscular Contraction. (*Jour. of Physiol., 1879.*)

34. WASHINGTON IRVING STRINGHAM (*Mathematics, 1878–80*), from Topeka, Kansas; A. B., Harvard, 1877.

Investigations in Quaternions. (*Am. Acad., 1878.*)
Some General Formulae for Integrals of Irrational Functions. (*Am. Jour. of Math, 1879.*)
The Quaternion Formulae for Quantification and for Barycentres. (*Am. Jour. of Math., 1879.*)

35. ABRAM VAN EPPS YOUNG (*Chemistry, 1878–80*), from Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875–77.

36. CHARLES ROBERT HEMPHILL (*Greek, 1878–79*), from Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874–78; A. M., Davidson, 1878; *Professor of Ancient Languages in the Southwestern Presbyterian University, Clarksville, Tenn.*

37. ALLAN MARQUAND (*Logic and Ethics, 1878–80*), from New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78.

38. CHARLES AMBROSE VAN VELZER (*Mathematics, 1878–80*), from Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876–77.

39. BROWN AYRES (*Physics, 1879–80*), from New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics at Johns Hopkins University, 1878–79.

The Gramme Machine. (*Sc. Amer. Supp., 1876.*)
The Telephone. (*Jour. of Franklin Inst., 1878.*)
New Arrangement for Telephone. (*Sc. Amer. Supp., 1878.*)
Two New Forms of Bell Telephone. (*Jour. of Franklin Inst., 1878.*)

40. LOUIS BEVIER (*Greek, 1879–80*), from New Brunswick, N. J.; A. B., Rutgers, 1878; Graduate Student of Greek at Johns Hopkins University, 1878–79.

41. EDWARD MUSSEY HARTWELL (*Biology, 1879–80*), from Littleton, Mass.; Public Latin School, Boston, Mass., 1869; A. B., Amherst, 1873, and A. M., 1876; Vice-Principal of High School, Orange, N. J., 1873–74; Instructor in Public Latin School, Boston, 1874–77; Student in Miami Medical College, Cincinnati, Ohio, 1877–78; Graduate Student of Biology and Chemistry at Johns Hopkins University, 1878–79.

The Function of the Internal Intercostal Muscles. (*Conjointly with Prof. H. N. Martin, Jour. of Physiol., 1879.*)

42. JOHN ROBIN MCDANIEL IRBY (*Mineralogy, 1879–80*), from Lynchburg, Va.; Miller Scholar of University of Virginia,

1873–75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878.

Eine kritische Untersuchung ueber die bei dem kalkspath vorkommenden Skalenoeder. (*Prize Essay of the University of Bonn, 1877, expanded and published under the title* On the Crystallography of Calcite, *Bonn, A Marcus, 1878; abstract in Groth's Zeitschrift, Bd. III.*)

43. MITSURU KUHARA (*Chemistry, 1879–80*), from Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, Japan, 1878–79; Rigaku Shi, (S. B.), University of Tokio, 1879.

On the Red Colouring Matter of the Lithospernum erythrorhizon. (*Jour. of Chem. Soc., London, 1879.*)

44. OSCAR HOWARD MITCHELL (*Mathematics, 1879–80*), from Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875–78; Graduate Student of Mathematics at Johns Hopkins University, 1878–79.

45. EDWARD LEAMINGTON NICHOLS (*Physics, 1879–80*), from Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875–79; Ph. D., Göttingen, 1879.

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (*Pogg. Annalen, 1878, N. F., Bd. 3.*)

Ueber das von glühendem Platin ausgestrahlte Licht. (*Inaugural Dissertation, Göttingen, 1879.*)

Papers on Radiation. (*Am. Jour. of Science, 1879.*)

46. WALDO SELDEN PRATT (*Æsthetics and the History of Art, 1879–80*), from Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878; Graduate Student of Greek and Archæology at Johns Hopkins University, 1878–79.

47. WILLIAM THOMSON SEDGWICK (*Biology, 1879–80*), from Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877–78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878–79.

48. HERMAN VOORHEES (*Chemistry, 1879*), from Troy, New York; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry at Johns Hopkins University, 1878–79. *Died October 14, 1879, without entering on the Fellowship, aged 27 years.*

49.* CHARLES OTIS WHITMAN (*Biology, 1879*), from Newton Highlands, Mass.; A. B., Bowdoin, 1858, and A. M., 1871; Ph. D., Leipsic, 1878; *Professor of Zoölogy in the University of Tokio, Japan.*

The Embryology of Clepsine. (*Quart. Mic. Jour., London, 1878.*)

50. EDMUND BEECHER WILSON (*Biology, 1879–80*), from Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877–79.

Description of two New Genera of Pycnogonida. (*Am. Jour. of Science, 1878.*)

The Pycnogonida of New England and Adjacent Waters. (*U. S. Fish Comm. Report, 1877.*)

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* Did not enter upon the Fellowship.

51. GEORGE FREDERICK NICOLASSEN (*Greek, 1879–80*), from Baltimore, Md.; A. B., University of Virginia, 1879.

Appointed since September 1, 1879.

52. WILLIAM BURNEY (*Chemistry, 1879–80*), from Davidson College, N. C.; S. B., Davidson, 1875; Ph. D., Heidelberg, 1879.

53. ROBERT WOODWORTH PRENTISS (*Mathematics, 1879–80*), from New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics at Johns Hopkins University, 1878–79.

Dr. Brooks and Dr. Morse were appointed Associates before entering upon the Fellowships.

GRADUATES.

DOCTORS OF PHILOSOPHY.

1878.

HENRY C. ADAMS, . (*Fellow in Political Science, 1876–9.*)
THOMAS CRAIG, . . . (*Fellow in Physics, 1876–9.*)
JOSIAH ROYCE, . . . (*Fellow in Philosophy, 1876–8.*)
ERNEST G. SIHLER, . . . (*Fellow in Greek, 1876–9.*)

1879.

MAURICE BLOOMFIELD. (*Fellow in Sanskrit and Greek, 1878–9.*)
SAMUEL F. CLARKE, . . . (*Fellow in Biology, 1877–9.*)
GEORGE B. HALSTED, . . (*Fellow in Mathematics, 1876–8.*)
EDWARD HART, . . (*Fellow in Chemistry, 1876–8.*)
WILLIAM W. JACQUES, . . (*Fellow in Physics, 1876–9.*)
HENRY SEWALL, . . . (*Fellow in Biology, 1878–9.*)

BACHELORS OF ARTS.

1879.

GEORGE W. MCCREARY, . . (*Balt. City College, 1874.*)
Matriculated Student, 1st, 2d, and 3d Academic Years, 1876–9.

A. CHASE PALMER, ... (*Princeton College.*)
Matriculated Student, 1st, 2d, and 3d Academic Years, 1876–9.

EDWARD H. SPIEKER, . . . (*Balt. City College, 1877.*)
Matriculated Student, 2d, and 3d Academic Years, 1877–9.

UNIVERSITY SCHOLARS.

1876.

GEORGE W. MCCREARY, . (*Balt. City College.*) Baltimore.
ALLDIN M. SPRIGG, . . (*St. John's College.*) Cumberland.

1877.

EDWARD H. SPIEKER, . (*Balt. City College.*) Baltimore.

1878.

WILLIAM W. BADEN, . . . (*Steuart Hall.*) Baltimore.
JOHN W. BROWN, . (*Mr. G. G. Carey's School.*) Govanstown.

GRADUATE SCHOLARS.

1879.

A. CHASE PALMER, . . . (*A. B., 1879.*) Baltimore.
EDWARD H. SPIEKER, . . . (*A. B., 1879.*) Baltimore.

B.

Enumeration of Classes which have been instructed during the Academic Year 1878-9.

The following list shows the principal classes which have been organized and instructed during the year:

The figures given in parenthesis indicate in the case of classes the number of students, and in the case of public lectures the average number of auditors.

Mathematics. (38 Students.)

Determinants and Modern Algebra (8). *Twice weekly, through the year: Prof. Sylvester.*
Mathematical Seminary (12). *Once monthly, through the year: Prof. Sylvester and Dr. Story.*
Elliptic Functions (2). *Twice weekly, through the year: Dr. Story.*
Higher Plane Curves (6). *Thrice weekly, first half year: Dr. Story.*
Solid Analytic Geometry (7). *Thrice weekly, second half year: Dr. Story.*
Differential Equations (5). *Twice weekly, through the year: Dr. Story.*
Differential and Integral Calculus (12). *Thrice weekly, through the year: Mr. Franklin.*
Analytic Geometry (Conics) (5). *Thrice weekly, through the year: Mr. Franklin:—Instruction given chiefly by lectures from notes prepared by Dr. Story.*
Theory of Equations (1). *Twice weekly, first half year: Mr. Franklin.*

The results of special studies upon the following subjects, among others, have been examined and discussed in the Mathematical Seminary, under the direction of Prof. Sylvester and Dr. Story:—Newton's rule for the limits of roots of algebraic equations; the rule of signs in trigonometry; barycentric coördinates; double points of plane curves; the quasi evolute; central harmonic transformation; special cases of Pascal's hexagram; transformation by elliptic coördinates.

Physics. (32 Students.)

General Physics (19). *Two experimental lectures and three recitations weekly, through the year: Dr. Hastings.*

Thermodynamics (7). *Thirty mathematical lectures and ten recitations: Prof. Rowland.*

Electricity and Magnetism (3). *Eighty mathematical lectures and twenty-seven recitations: Prof. Rowland.*

Theoretical Dynamics (6). *Fifteen mathematical lectures: Dr. Craig.*

Spherical Harmonics (6). *Ten mathematical lectures: Dr. Craig.*

Hydrodynamics (7). *Twenty-four mathematical lectures: Dr. Craig. The substance of this course was given a second time in eleven lectures addressed to Civil and Military Engineers.*

Theory of the Telescope (15). *Four lectures, to astronomers and mathematicians, delivered in Washington: Dr. Hastings.*

Laboratory Work for special Students (7). *Five times weekly, through the year: Prof. Rowland.*

Laboratory Work: Saturday Class for advanced Students (9). *Once weekly, through the year: Dr. Hastings.*

Laboratory Work: Saturday Class in General Physics (7). *Once weekly, through the year: Dr. Hastings.*

Reading and Discussion of current Physical Journals (7). *Once weekly, through the year.*

The Fellows and advanced students have also been engaged in researches under the direction of Prof. Rowland: In determination of the diamagnetic constants of bismuth and calc spar; on the distribution of heat in the spectrum of a platinum wire heated to various known temperatures; on the law of radiation at high temperatures; on the ratio of the electromagnetic to the electrostatic units of electricity; on various problems in hydrodynamics, etc.

Chemistry. (39 Students.)

General Chemistry (39). *Four lectures by Prof. Remsen, and two examinations by Dr. Morse, weekly, first half year*

General Chemistry (continued) (18). *Four lectures and two examinations weekly, second half year: Dr. Morse.*

Laboratory Work (30). *Four to eight hours daily, through the year: Prof. Remsen and Dr. Morse.*

Organic Chemistry (14). *Four lectures weekly, second half year: Prof. Remsen.*

Analytical Chemistry (11). *Once weekly, through the year: Dr. Morse.*

History of Chemistry (15). *Twelve lectures: Prof. Remsen.*

Reading and Discussion of current Chemical Journals (7). *Twice weekly, through the year.*

The Fellows and advanced students have also been engaged daily in the laboratory in following out various investigations, mostly under the direction of Prof. Remsen. The principal of these are: On the oxidation of cymenesulphamide; on the oxidation of orthotoluene sulphamide; on the oxidation of nitroxylenes; on the use of various oxidizing agents on the oxy-acids; comparison of sulpho-acids prepared by different methods. The results of the investigations referred to have either already been printed, or will soon be published in full in the chemical journals.

Biology. (26 Students.)

General Biology (13). *Twenty lectures, with practical study in laboratory: Prof. Martin.*

Animal Physiology: Advanced Course (8). *Twenty lectures, with demonstrations: Prof. Martin.*

Animal Physiology: Elementary Course (13). *Fifty-five lectures with practical work, demonstrations, and weekly examinations: Prof. Martin.—Examiners, Prof. Donaldson and Prof. Latimer.*

Animal Morphology: Advanced Course (3). *Fifty lectures, with laboratory work: Dr. Brooks.*

Animal Morphology: Elementary Course (6). *Sixty lectures, with laboratory work and weekly examinations: Dr. Brooks —Examiner, Prof. Martin.*

Embryology (7). *Twelve lectures, with laboratory work: Dr. Brooks.*

Vegetable Morphology (9). *Twenty-four lectures, with laboratory work: Prof. Farlow.*

Laboratory Instruction (26). *Daily through the year: Prof. Martin and Dr. Brooks.*

Demonstrations in Animal Physiology to Medical Students (25). *Twenty lectures, illustrated with experiments: Prof. Martin.*

Practical instruction in Animal Histology to Medical Students (12). *Sixteen lectures, with laboratory work: Mr. Sewall.*

Teachers' Class in Zoölogy (15). *Fifteen lectures, with laboratory work, three hours a week for fifteen weeks: Dr. Brooks.*

General Biology (66). *Twenty public lectures: Prof. Martin.*

Various Botanical Topics (89). *Six public lectures: Prof. Farlow.*

During the year investigations have been carried on by advanced students, under the direction of Professors Martin and Brooks, in various subjects as follows:—Function of certain respiratory muscles; the respiratory functions of certain nerves; the phenomena of muscular contraction; the effect of increased temperature on the respiratory rhythm; the development of Amblystoma; the locomotion of Gasteropods, etc. The results of several of these investigations have been published.

During the summer of 1878 the Chesapeake Zoölogical Laboratory, for the study of forms of marine life, was conducted for eight weeks by Dr. Brooks, at Fort Wool, Va., with an attendance of ten students. It was reopened at Crisfield, Md., June 25th, 1879, and continued there and at Fort Wool until September 15th. A party of twelve investigators availed themselves of its facilities.

Greek. (40 Students.)

Lucian (12). *Once a week, through the year: Prof. Gildersleeve.*

Aristophanes, *Frogs* (14). *Thirteen meetings: Prof. Gildersleeve.*

Syntax of Moods and Tenses (6). *Once a week, from November to the end of the year: Prof. Gildersleeve.*

Practical exercises in translating Greek into English and English into Greek at dictation. *Twice a week, from April to the end of the year: Prof. Gildersleeve.*

Greek Seminary (13). *Once a week, through the year: Prof. Gildersleeve.*

Thucydides (14). *Four times weekly, first half year: Prof. Morris.—Examiner, Mr. Savage.*

Euripides, *Ion*, *Bacchae* (7). *Four times weekly, second half year: Prof. Morris.—Examiner, Prof. Gildersleeve.*
Plato, *Phaedo* (7). *Five times weekly, first half year: Prof. Cross.—Examiner, Dr. E. G. Sihler.*
Plato, *Protagoras* (2). *Four times weekly, for three months: Dr. E. G. Sihler.*
Aeschylus, *Prometheus* (4). *Five times weekly, second half year: Prof. Cross.—Examiner, Prof. Gildersleeve.*
Xenophon, *Anabasis* (3). *Four times weekly, second half year: Prof. Cross.—Examiner, Mr. Bevier.*
New Testament Greek (3). *Once weekly, second half year: Prof. Cross.*
Cyprus and Mycenae (81). *Eight public lectures: Mr. Savage.*
New Testament (12). *Ten public lectures: Prof. Cross.*

Students have privately read and been examined in:

Plato, *Apology, Crito* (1). *Examiner, Mr. Harding.*
Herodotus, *lib. v-ix.* (1). *Examiner, Prof. Morris.*
Euripides, *Phoen., Alc., Hippol.* (1). *Examiner, Prof. Gildersleeve.*
Euripides, *Medea* (2). *Examiner, Prof. Gildersleeve.*
Aeschines, *in Ctesiphont.* (1). *Examiner, Prof. Gildersleeve.*
Demosthenes, *de Corona* (1). *Examiner, Prof. Gildersleeve.*
Demosthenes, *Olynthiacs* (3). *Examiner, Prof. Morris.*
Demosthenes, *in Lacritum* (3). *Examiner, Prof. Morris.*
Sophocles, *Five Plays* (1). *Examiner, Prof. Everett.*
Homer, *Iliad, i-ix.* (1). *Examiner, Prof. Gildersleeve.*

The exercises of the Greek Seminary have consisted in analysis, exegesis and criticism of selected tracts of Lucian, and in the prosecution of researches into the language of Lucian and the life of the second century, such as Lucian's relation to Herodotus, the Ionism of the *Dea Syria* and the *De Astrologia*, the use of the optative in Lucian, Lucian and Diogenes Laertius, traditions as to the oriental origin of Greek philosophy, the worship of the Syrian Goddess, Lucian's attitude toward religion, and Lucian as a student of art. Some of the more elaborate papers were transferred to the Johns Hopkins Philological Association. The Seminary was conducted by Prof. Gildersleeve.

Latin. (27 Students.)

Juvenal (10). *Four times weekly, first half year: Prof. Morris.—Examiner, Prof. Maupin. Five times weekly, second half year: Prof. Cross.—Examiner, Prof. Morris.*
Persius (8). *Four times weekly, first half year: Prof. Morris.—Examiner, Prof. Gildersleeve.*
Cicero, *Brutus* (6). *Four times weekly, second half year: Prof. Morris. Examiner, Prof. Maupin.*
Cicero, *Orator* (6). *Four times weekly, second half year: Prof. Morris. Examiner, Prof. Maupin.*
Tacitus, *Annals* (9). *Five times weekly, second half year: Prof. Cross.—Examiner, Prof. Maupin.*
Livy (13). *Five times weekly, first half year: Prof. Cross.—Examiner, Prof. Maupin.*

Students have privately read and been examined in

Plautus, *Captivi* (1). *Examiner, Prof. Maupin.*
Terence, *Phormio* (2). *Examiner, Prof. Maupin.*
Terence, *Hautontim* (1). *Examiner, Prof. Maupin.*

Terence, *Andria* (3). *Examiner, Prof. Maupin.*
Tacitus, *Germania, Agricola* (5). *Examiner, Prof. Maupin.*
Tacitus, *Hist. lib. i.* (4). *Examiner, Prof. Maupin.*
Cicero, *Select Letters* (1). *Examiner, Prof. Morris.*
Cicero, *de Officiis* (1). *Examiner, Prof. Maupin.*
Horace, *Satires* (1). *Examiner, Prof. Everett.*
Horace, *Odes, Epodes* (6). *Examiner, Prof. Everett.*
Virgil, *Aeneid* (5). *Examiner, Prof. Everett.*

German. (55 Students.) *Prof. Brandt.—Examiners, Prof. Elliott and Prof. Raddatz.*

Major Course (16). *Five times weekly, first half year.*
Minor Course (17). *Five times weekly, through the year.*
Goethe, *Faust* (15). *Once weekly, through the year.*
Lessing, *Laokoon* (13). *Once weekly, second half year.*
Middle High German [Nibelungenlied]. (7). *Two lectures and two recitations weekly, second half year.*
Scientific German (14). *Once weekly, second half year.*
German Literature (17). *Six lectures.*

French. (15 Students.) *Prof. Rabillon.—Examiner, Prof. Elliott.*

Major Course (10). *Twice weekly, through the year.*
Minor Course (5). *Twice weekly, through the year.*
Special Class. *Once weekly, second half year.*
French Romantic Literature (35). *Eleven public lectures.*

Romance Languages. (3 Students.) *Prof. Elliott.*

Old French [Serments de Strassbourg; Cantilène de Sainte Eulalie; La Passion de Christ; Vie de Saint Léger; Vie de Saint Alexis]. (3). *Five times weekly, through the year.*
Provençal [Poëme sur Boëce; extracts from writings of Guillaume IX. Comte de Poitiers; the Roman de Girart de Rossilho]. (2). *Once weekly, through the year.*
Scientific Grammar (3). *Once weekly, through the year.*
Italian [Dante, *Purgatorio*]. (2). *Twice weekly, through the year.*
Geographical Distribution of the Old French Dialects (3). *Lectures weekly, through the year.*
Dante, *Divina Commedia* (152). *Ten public lectures.*

Sanskrit. (4 Students.) *Prof. Lanman.*

Hymns of the Rig Veda (1). *Thrice weekly, through the year.*
Kathâsaritsâgara, and Yâjñavalkya (1). *Twice weekly, first half year.*
Elementary Sanskrit [Nala, Hitopadeça, Manu]. (3.) *Twice weekly, through the year.*

Shemitic. (9 Students.) *Prof. Murray.*

Arabic (2). *Twice weekly, first half year.*
Syriac (4). *Thrice weekly, first half year.*
Biblical Hebrew (6). *Twice weekly, first half year.*
Shemitic Literature (9). *Twelve lectures.*
Hebrew: Elementary Course (3). *Thrice weekly, through the year: Mr. Bloomfield.*
Poetical Books of Old Testament (41). *Nine public lectures: Prof. Murray.*

Logic. (6 Students.) *Mr. Marquand.*

Bacon's Novum Organum (2). *Twice weekly, second half year.*
Inductive and Deductive Logic (5). *Four times weekly, second half year.—Examiner, Prof. C. D. Morris.*
Elementary Course (2). *Thrice weekly, first half year.*

Ethics. (6 Students.)

History of English Ethics (4). *Once weekly, second half year: Mr. Marquand.*
Reading Class (4). *Twice weekly, December and January: Mr. Marquand —Examiner, Prof. G. S. Morris.*
Topics Historical and Practical in Ethics (123). *Ten public lectures: Prof. G. S. Morris.*

History. (25 Students.)

Seminary of American History (10). *Once weekly, through the year: Dr. Scott.*
European History during the Middle Ages (14). *Four times weekly, first half year: Dr. Adams.—Examiner, Dr. Scott.*
German History (9). *Twice weekly for two months: Dr. Adams.*
German Empire (258). *Ten public lectures: Prof. Von Holst.*
Beginnings of Church and State (83). *Ten public lectures: Dr. Adams.*
History of Greece in Fifth Century B. C. (39). *Ten public lectures: Dr. E. G. Sihler.*
Thirty Years War (192). *Twenty public lectures: Prof. Diman.*

Political Science. (15 Students.)

Seminary of English Constitutional Law (15). *Six meetings; Prof. Cooley.*
Political Economy (15). *Four times weekly, two months: Dr. Adams.*
Evils in Local Government (87). *Six public lectures: Prof. Cooley.*

C.

List of Apparatus for Scientific Researches involving Accurate Measurements in the Physical Laboratory.

The list does not include apparatus for demonstration.

Republished, with additions, from Harvard University Library Bulletin, No. 12, 1879.

ACOUSTICS.

All the ordinary apparatus by Koenig of Paris, including Helmholtz's double siren, Lissajou's vibrating microscope, Hastings' pendulum comparator, &c.

OPTICS.

1. *Meyerstein Spectrometer*—large model. The circle is of 16 centimeters radius, divided on silver to 6′ and reading by two microscopes to 2″. The probable and periodic errors of graduation have been investigated, and are given in the American Journal of Science, vol. xv. p. 270. Having a common axis with the large circle is a table rotating independently, 6.5 centimeters radius, graduated on a silver limb and by two verniers to single minutes. The massive stand has a joint by which the circle may be brought into a vertical plane. Aperture of telescope and collimator 4.0 centimeters, focal length 34 centimeters, powers from 13 upward. A smaller telescope 2.0 centimeters aperture, 18.0 centimeters focal length, power 7, may be placed on a third support rigidly connected with the microscope bearers. The accessories of this instrument are:—

(*a*). Two telescopes with Nicol prisms before objectives: longer diagonals of prisms, 2.0 centimeters; length of telescopes, 20.0 centimeters; power, 3; position angles of prisms read by circles of 3.5 centimeters radius to minutes of arc.

(*b*). Babinet's compensator with wedge of 3 centimeters available length.

(*c*). High power collimating ocular.

(*d*). Low power collimating ocular.

(*e*). Three micrometer eye-pieces.

2. *Spectrometer*, by Schmidt and Haensch. The circle has a silver limb 16 centimeters radius, divided to 6′ and read by microscopes to 2″. Table in centre has a graduation 6.0 centimeters radius, reading by verniers to 1′. Aperture of objectives of telescope and collimator, 3.9 centimeters; focal length, 35.0 centimeters; power, 13. The angle between lines of collimation of telescope and the collimator may be read by small circle to single degrees.

3. *Steinheil's Spectroscope.* The clear aperture of train, including two 60° prisms, is 4.0 centimeters. Focal length of collimator and telescope 32.5 centimeters, powers, 8, 12, *etc.* Photographic scale.

4. *Silbermann's Heliostat*, etc. This instrument, by Duboscq, has two mirrors 18.0 centimeters by 9.0 centimeters, one silver under glass and the other silver. Also, *porte-lumière.*

5. *Heliostat*, with perfect plane mirror 16.8 c. m. diameter. Designed by Rowland and made by Schneider.

6. *Jamin's Interferential Refractometer*, with tubes 100 centimeters long, for the study of refraction in gases and a glass trough 20 centimeters long for liquids, by Duboscq.

7. Complete apparatus for the study of phenomena of interference, by Duboscq.

8. *Photographic Apparatus.* Objective 6.1 centimeters aperture, and about 40 centimeters focal length for plates; 10 × 12 inches, by Steinheil. Dark room, collection of chemicals and everything necessary for experiments on the subject.

9. *Becquerel's Phosphoroscope*, by Duboscq.

10. *Polarizing Apparatus*, from Steeg; also from Duboscq.

11. Apparatus for producing monochromatic light of any color. Designed by Hastings and made by Schneider.

12. *Prisms, gratings*, etc.

a. Hollow prism from Meyerstein; aperture, 6.1 × 5.2 centimeters.

b. Hollow prism from Steinheil; aperture, 2.2 centimeters.

c. Thallium glass prism from Steinheil; aperture, 4.8 centimeters.

d. Two flint glass prisms from Steinheil; aperture, 4.7 centimeters.

e. Crown glass prisms from Steinheil; aperture, 4.8 centimeters.

f. Two quartz prisms from Steeg; faces, 3.4 × 3.0 centimeters.

g. Iceland spar prism; faces, 2.6 × 2.2 centimeters, by Steeg.

h. Two rocksalt prisms; faces, 5.0 × 4.0 centimeters, by Steeg. Also rocksalt lens.

i. Large Nicol prism, largest diagonal 6.5 centimeters. Also a number of smaller ones.

j. Gratings on speculum metal 4.3 × 3.9 centimeters with 8648 lines to the inch and 4.4 × 4.4 centimeters with 17396 lines to the inch, and a smaller glass grating with 8648 lines to the inch, all by Chapman with Rutherfurd's engine.

Kirchoff's, Angstrom's, and Rutherfurd's maps of the solar spectrum.

k. Old telescope by Dollond. Objective about 4 in. diameter and 6 ft. focal length.

ELECTRICITY AND MAGNETISM.

The distinguishing feature of the apparatus for these subjects is its accuracy and the determination of the constants in absolute measure. The collection is *unique* in this respect.

13. *Rowland's Absolute Electrometer* for potentials represented by sparks of about 0.1 to 1 inch. Designed on Sir Wm. Thomson's guard-ring principle and constructed by Edelmann of Munich. Guard-ring 33.6 centimeters diameter, and can be separated about 7 centimeters, the distance being read by vernier to 0.01 centimeter. Movable disc 10 centimeters diameter, and *firmly* attached to arm of a balance sensitive to 1 mgr. Balance moves only .01 centimeter, and means of two distances of the discs are taken, the one to move it to upper and the other to lower stop. Weights of from 1 to 5 grammes ordinarily used. *Discs ground and polished to mirror surface after nickel plating.*

14. *Rowland's Electrostatic Standard Condenser.* Constructed by Grunow of New York. One sphere within the other *nickel plated and ground to mirror surface*, with extra ball for interior. Balls, 7 and 8 inches diameter. Hollow sphere, 10 inches diameter. Apparatus for centering. Radii determined by loss of weight in water. Can be charged and discharged any number of times at the rate of three per second, by means of fine wires which pass in momentarily from outside and so do not change the capacity much. Any condenser can be compared with it by means of an electrometer.

15. *Thomson's Quadrant Electrometer*, by White of Glasgow, with Thomson's key.

16. *Condenser* $\frac{1}{4}$ microfarad by Elliott.

17. *Commutators* for high (say 1 inch spark) as well as low tension.

18. *Rowland's Galvanometer* for the absolute measurement of discharges of high tension. Constructed by Rowland and Schneider. Coils wound with paper between, and boiled in parafine *in vacuo* at 100° C. to be thoroughly dry. Needle shielded from electrostatic action, and deflection read by mirror and scale. Number of coils about 11000. Constant on the cm. gr. second system 19091. = G of Maxwell as determined by comparison with galvanometer described in American Journal of Science, vol. xv., p. 334. See no. 19 below.

19. *Rowland's absolute Galvanometer* for the measure of quite weak currents Constant 1833.2. See American Journal of Science, vol. xv., p. 334. Constant very accurately known. 1790 turns. Can be used as sine galvanometer or with mirror and scale. Horizontal circle reads to

1′, but is readily estimated to 30″. Telescope and bar for determining horizontal intensity in exact position of instrument.

20. *Rowland's Tangent Galvanometer*, brass circle 50 centimeters diameter. Circle graduated to 15′ and 20 centimeters diameter. From 1 to 243 turns can be used, the constant of each set being known with great accuracy. Made by Meyerstein, but altered and wound and coils measured by Rowland.

21. *Two Thomson's Galvanometers* of high and low resistance, the first differential with coils around both needles and set of shunts. Made by Elliott of London.

22. *Two Nobili Astatic Galvanometers* by Elliott, and one by Salleron.

23. *Wiedemann Galvanometer* with two sets of coils and two kinds of needles. Reading by mirror and scale.

24. *Galvanometer* with large wire for experiments on the damping effect of the coils on the needle, and for determining resistances in absolute measure. Designed by Rowland and made by Schneider.

25. *Tangent Galvanometer*, wooden circle, with variety of coils of known constant.

26. *Mirror Galvanometer.*

27. *Rowland's wooden circle*, 84 centimeters diameter, carefully laid up out of maple wood, and containing several grooves on the edge to contain single wires. It is used to surround a galvanometer when, by the aid of the electrodynamometer, the horizonal intensity can be measured at any instant. Extremely useful.

28. *Electrodynamometer* of form given in Maxwell's Electricity, vol. ii, p. 330. Outer circles about 27.5 centimeters diameter with 240 windings on each side. Constant, G, of outer coils 78.371 on cm. gm. second system. Inner coils about 5.5 centimeters diameter with 63 coils in each. Moment of inertia of suspended coil accurately known Constant calculated and also determined by comparison with a tangent galvanometer made of the circle described above. Made (partly) by Gurley of Troy, and circles wound and measured by Rowland.

29. *Electrodynamometer*, Quincke's form for weak currents. Made by Edelmann of Munich.

30. *Standards of Resistance* mounted so that they can be placed in water. 1 and 10 ohms by Elliott; 10, 100, and 1,000 ohms by Warden. Muirhead, and Clark of London; also mounted in another style 1, 10, and 100 Siemens' units, by Siemens and Halske of Berlin. Also three copies of coil whose absolute resistance was determined by Rowland as 34.719 *earthquad.* ÷ *sec.*

31. *Resistance coils* in boxes 1 to 10,000 and 10,000 to 100,000 ohms by Elliott, and 1 to 10,000 Siemens' units by Edelmann.

32 *Rowland's Resistance Comparator.* Ten coils of 10 ohms each, arranged so that they can be joined in series or abreast thus making 1, 10, and 100 ohms besides intermediate ones. Made by Schneider and adjusted by Rowland.

33. *Two bridges* of Jenkins' form for the accurate comparison of equal resistances, and also a Wheatstone bridge, having wire of platinum-iridium alloy one meter long, by Elliott.

34. *Magneto-electric Machine* for 1,200 candles, by Siemens Brothers, London, with engine to drive it, and both Siemens' and Foucault's lamps. Also battery of 60 large bichromate cells.

35. *Ruhmkorff coil*, spark 15 or 20 centimeters, by Ruhmkorff of Paris.

36. *Rowland's Earth inductor* with *brass* circle. 30 centimeters diameter, wound and measured by Rowland. Made by Meyerstein of Göttingen.

37. *Ruhmkorff's Apparatus* for diamagnetism. Made by Ruhmkorff of Paris.

38. *Electric Clocks* beating seconds from regulator.

39. *Rowland's Standard of Electromagnetic Induction.* Three coils on brass cylinders which can be placed accurately on top of each other. See American Journal of Science, Vol. XV. Mutual potential of coils with unit current 3775500., 2561974., 2051320, *etc.*, on the cm. grm. second system.

40. *Telescopes, Scales, and Mirrors.* Silvered brass millimeter scale by Brown and Sharp. Mounted telescope by Steinheil, objective 4.0 centimeters diameter, with three oculars, giving powers of 20, 40, and 80. Unmounted telescope by Steinheil, objective 2.7 centimeters diameter, and 3 oculars.

Mounted telescope and paper scale by Meyerstein: objective, 2.7 centimeters diameter.

41. Thin mirrors and plain parallel glasses by Steinheil. The mirrors give a *perfect image of the highest magnifying power.*

Thomson's Replenisher on large scale for use with electrometer, Holtz and friction machines, Leyden jar batteries, Geissler tubes, &c.

HEAT.

42. *Rowland's Instrument for comparing the mercurial with the air Thermometer* between 0 and 100° C. Constructed by Schneider. Readings seldom differ more than 0.02° or 0.03° C. at any one point, especially up to 40° C., and a change is contemplated which will much improve it.

43. *Rowland's Instrument for comparing Thermometers* from 0° to about 300° C. Constructed by Schneider. Accurate to about 0.1° C.

44. *Regnault's Air Thermometer*, Golaz, Paris.

45. *Jolly's Air Thermometer*, by Berberich, Praeparator, Phys. Inst., Univ. of Munich.

46. *Regnault's Apparatus for Expansion of Gases* both at constant pressure and constant volume, also Regnault's form of Rudberg's apparatus, Golaz, Paris.

47. *Regnault's Apparatus for Tension of Vapors*, including: *a.* The boiler; *b.* The reservoir for compressed air; *c.* A rotary pump for compressing gases; *d.* Mercurial manometer. Maker, Golaz, Paris.

48. *Regnault's Apparatus for specific Heat* of solids, Golaz, Paris.

49. *Regnault's Hygrometer with Aspirator*, Golaz. Paris.

50. *Thermometers*, about 30 or 40, principally by Baudin, Paris, and Geissler, of Bonn. Many of these have been compared with the air thermometer as well as with standards by Fastré, Casella, or from Kew. The thermometers up to 40° C. undoubtedly represent the air thermometer more accurately than any so far constructed, and are supposed to agree with it to about 0.01° C. They have been compared with it eight times during about one year or more. The error in calorimetric investigations from using uncompared thermometers *may* amount to two per cent.

51. *Rowland's Apparatus for determining Change of specific Heat of Liquids* with temperature. Constructed by Schneider.

52. *Dulong's Apparatus for the Heat of Combustion*, Salleron, Paris.

53. *Melloni's Apparatus* for radiant energy, Salleron, Paris.

54. *Two Instruments for the Calibration* of mercurial thermometers, one by Golaz and the other by Salleron.

55. *Rowland's Apparatus for determining the mechanical Equivalent of Heat*, or for investigating the specific heat of liquids and their change with rise of temperature.

This instrument was constructed by the aid of funds contributed by the Rumford committee of the American Academy of Arts and Sciences, but the instrument will remain for the present at Baltimore. It was constructed by Schneider. It is run by a petroleum engine, No. 67 below.

*** To be constructed soon:—

Apparatus for compressing gases to 1000 atmospheres.

Apparatus for *accurately* determining the form of the adiabatic curve of gases and vapors *at any temperature up to about* 100° C.

Miscellaneous.

56. *Comparator*, by Meyerstein, for bars 1 meter long. Microscopes cannot be set nearer than 10 centimeters. One division of head of micrometer screws is about $\frac{1}{700}$ millimeter.

57. *Microscope Comparator*, designed by Rowland after Rogers' plan, and made by Grunow.

58. *Dividing Engine*, by Perreaux. Free motion about 55 centimeters. Screw, $\frac{1}{2}$ millimeter thread. Head divided into 250 parts. 501 divisions of head gives 1 millimeter almost exactly. Subsidiary screw at right-angles to the other.

59. *Air Pumps.* Rotary and common, by Ritchie, of Boston; mercury, on Jolly's plan, by Berberich, of Munich.

60. *Rotary Pump* for compressing gases to 15 atmospheres, Golaz, Paris.

61. *Three Mercury Guages;* one about 25 meters high, and measuring pressures up to about 33 atmospheres; one movable and measuring pressure from 1 to 4 atmospheres; and one measuring from 0 to 1 atmosphere.

62. *Barometer*, by James Green of New York, with very large tube.

63. *Two Cathetometers*, one by Meyerstein, and the other by Salleron.

64. *Standard Meters*, compared at Washington.

65. *Balances and Weights.* One balance weighing to 5 kilo. and accurate to about 1 mg. with weights from 5 kilo. to 1 mg. One weighing to 200 grms. accurate to about 0.1 mg. with weights from 100 gr. to 1 mg. These are by Schickert of Dresden. One heavy balance weighing to about 25 kilo. and accurate to about 0.1 grm. by Schneider.

Standard glass kilogramme on Jolly's plan, and compared with Berlin standard. From Berberich in Munich.

The first balance mentioned is mounted on top of a case, so that globes for weighing gases can be suspended beneath it.

66. *Clock-work* with Foucault's regulator for running small apparatus at a regular velocity.

67. *Petroleum Engine* of three-horse power. It is capable of giving a large amount of compressed air at more than 100 pounds to the square inch pressure, and might be used for repeating Thomson's and Joule's experiments, or any others on the flow of gases.

68. *Two Spherometers*, large by Meyerstein, and small by Salleron.

69. Several extra micrometer eye-pieces.

70. *Apparatus for Researches on the Flow of Liquids.* Greatest available head about 1.4 meters.

71. *Revolving mirror* capable of 250 revolutions per second. Mirror of glass silvered on both sides and 4.7 cm. diameter. Driving power, compressed air from a Root blower. Designed by Rowland and made by Schneider.

72. *Metallic Manometer* for very minute differences of pressure, from Edelmann of Munich.

*** Nos. 19, 25, 26, and 28 and the silvered scale of No. 40 belong to Professor Rowland, but are used in the laboratory.

List of the More Important Physiological Apparatus in the Biological Laboratory.

1. Eighteen microscopes, by Zeiss of Jena; magnifying 60, 110, 220 and 400 diameters.

2. One complete monocular microscope, by the same maker, with a set of oculars and objectives magnifying from 10 to 1700 diameters. Also, a microspectroscope and polarising apparatus, camera lucida, condenser, &c.

3. Two Stricker's "hot stages."

4 Two ditto, with Shäfer's self-regulating apparatus for maintaining a constant temperature.

5. Two Zeiss and six other microtomes.

6. Two Zeiss dissecting microscopes.

7. Four DuBois-Raymond induction coils.

8. Dewsmith's levers. Made of Aluminium and delicately poised; working on steel points in agate cups. The two levers work vertically over one another in the same plane and are available for recording very feeble movements.

9. Kronecker's capillary contact apparatus, much improved, giving any desired number of contacts from 1 to 50 per second.

10. Bernstein's "*acustische unterbrecher*," somewhat modified.

11. Resistance coil 1-10 to 100 ohms. Elliott, London.

12. Reochord and Wheatstone's bridge. Elliott, London.

13. Seconds clock, with electric connections for working chronographs, &c.

14. Thomson's reflecting galvanometer and shunt. Resistance 6601 ohms at 16 5° C.

15. Thomson's reflecting galvanometer. Resistance 0.4347 ohm at 23° C.

16. Metronome, with electrical attachment, giving contacts from 6 to 240 times in a minute.

17. Six small thermopiles.

18. Konig's recording tuning forks, three pairs, vibrating respectively 50, 100 and 200 times in a second

19. "Signal," of Deprez, working up to 250 vibrations per second.

20. Marey's chronograph, working up to 100 vibrations per second.

21. Martin's self-feeding chronograph pens (4).

22. Helmholtz's electromotor. Zimmerman, Heidelberg.

23. Bernstein's rheotom. Zimmerman, Heidelberg.

24. Pendulum myographion, modified from Fick's: available for the measurement and analysis of rapid movements. The instrument consists essentially of a pendulum carrying a glass plate at the bottom, swinging on friction rollers, and corrected for the latitude of Baltimore, so as to swing in one second. Behind the pendulum is a divided arc, and the amplitude of the swing can be varied from a few inches to four feet. In use, an electro-magnet is moved along the divided circle, and then—the current being closed through it—the pendulum on being raised is held by it. On the other side is a catch, also movable along the arc. By turning a key at the side, the current in the electro-magnet is broken, and the pendulum swings across, and is held by the catch on the other side. During its transit, the movement to be analyzed is inscribed on the glass plate, which is previously smoked. Designed by A. G. Dewsmith, Esq., Trinity College, Cambridge, England. Made by Elliott, London.

25. Brunton's double myograph.
26. Ludwig's kymographion, (2), one with an improved regulator. Fulcher, Cambridge, Eng.
27. Kymographion, modification of the above, giving both slower and more rapid movement. Warden, Muirhead & Clark, London.
28. Ludwig's stromuhr.
29. Mosso's plethysmograph.
30. Marey's sphygmograph.
31. Injecting apparatus, with water pressure.
32. Czermak's rabbit holders (2).
33. Bernard's dog holders (2).
34. Spectroscope, by Browning, London, (one prism.)
35. Wild's polaristrobometer.
36. Rotating cylinder, run by clockwork. Hawksley, London.
37. " " " " Baltzar, Leipsic
38. " " " " Fulcher, Cambridge.
39. Marey's tambours (3)
40. Kronecker's digestion apparatus.
41. Seconds pendulum, for breaking electric currents.
42. Roy's apparatus for measuring changes in arterial pressure. (Jour. Physiol., Vol. II, p. 68.)
43. Warm chamber with self-regulating apparatus for maintaining a constant temperature.

Apparatus available only for teaching purposes or demonstration is excluded from this list; as also the ordinary outfit of every laboratory—as balances, glass ware, thermometers, filter pumps, electric batteries and keys, electrodes, surgical instruments, moist chambers, muscle levers, &c., &c.

Chemical Laboratory.

The Chemical Laboratory is a new building well arranged and equipped. It has the usual collection of balances; platinum and silver utensils; a spectroscope; a polarizing apparatus, made by Herman and Pfister; a goniometer, made by Fuess of Berlin, such as is described in Groth's Physikalische Krystallographie. The circle of the goniometer is of silver, and is divided to $\frac{1}{4}°$; it has two verniers which read to 30″, and angles may be readily estimated to 10″. It has two telescopes, one to focus the image of a slit, and the second, to observe the crystals and image of the slit.

D.

Report of Chesapeake Zoölogical Laboratory.

Summer of 1879.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Second Session of the Chesapeake Zoölogical Laboratory.

ORGANIZATION.

In order to present an opportunity for studying the oyster beds of the Bay, and thus secure the coöperation of Maj. Ferguson, Assistant U. S. Fish Commissioner, I determined to open the laboratory at Crisfield, a point which is unfavorable in most other respects. The laboratory was accordingly opened at Crisfield on the 25th of June in three of the barges of the Maryland Fish Commission.

I stated in the preliminary announcement that the laboratory would be moved to some more desirable locality farther down the Bay, about July 10th, but the transportation of the barges was attended with so much expense that I was not able to move them to the second station, and we occupied them at Crisfield until August 8th. During part of this time Maj. Ferguson's steam yacht, the Lookout, which he had fitted up with steam dredging apparatus for the purpose, was with us, and rendered valuable help in dredging and collecting. Through Maj. Ferguson's influence we also had the use of a small steam launch which was detailed for the purpose from the U. S. Navy.

Early in August the musquitoes became so numerous as to render the the barges uninhabitable, and as I was not able to move them, we transferred our outfit to our old quarters at Fort Wool, which had again been placed at our service by Maj. Gen. Q. A. Gillmore, U. S. A.

The party remained at Fort Wool until September 15th, thus extending the second session of the laboratory over eleven weeks.

The following is a list of the members of the party.

MEMBERS OF THE STAFF.

W. K. BROOKS, Ph. D., *Associate in Biology.*
In charge of Laboratory.
S. F. CLARKE, Ph. D., *Assistant in Biological Laboratory.*
Assistant in Laboratory.
B. W. BARTON, M. D., *Baltimore.*
EMIL BESSELS, M. D., Ph. D., *Smithsonian Institution.*
E. A. BIRGE, Ph. D., *Prof. of Zoölogy, Univ. of Wisconsin.*
H. C. EVARTS, M. D., *Acad. of Science, Philadelphia.*
E. A. NUNN, M. A., *Prof. of Biology, Wellesley College.*
H. J. RICE, M. A., *Cazenovia, N. Y.*
E. B. WILSON, Ph. B., *Johns Hopkins University.*
K. MITSUKURI, Ph. B., *Yale College.*
AUGUST SCHMIDT, M. A., *Baltimore.*
C. SIHLER, M. D., *Johns Hopkins University.*

SCIENTIFIC INVESTIGATIONS.

As most of the members of the party were trained investigators the amount of work which we were able to accomplish was very satisfactory. Some of it is now in press, and there are a number of completed papers ready for publication, and I hope that means for this purpose will be found during the year.

It is impossible to give a short statement of the results of the prolonged study of a technical scientific problem, and I must refer to future publications for information regarding the work which was accomplished by our party. The following is a list of those subjects in regard to which our labors were most fruitful in new information:

Dr. Clarke devoted most of the season to the collection and study of Hydroids, and he finds that most of the species which occur in the Bay are new to science. Interesting hydroids were found in great abundance, but the season proved to be too short for the thorough study of all the forms which were collected, though in addition to the description of a number of new species, Dr. Clarke was able to make important observations upon their structure, manner of growth, and other points of interest.

Prof. Birge succeeded in making a very complete series of observations upon the larval stages of two genera of crabs. He traced these from the egg to the adult form, and secured a complete series of drawings showing each appendage at each stage of development.

The interesting field upon which Prof. Birge has thus made a beginning, is one in which the Chesapeake Bay furnishes unrivalled facilities, and a number of workers could easily find here material for years of study. I hope that future years will show important results from the investigation of the development of the crustacea of the bay, for this is undoubtedly the subject upon which the laboratory may be expected to yield the most abundant and valuable contributions to science.

Prof. Birge, together with myself, made several attempts to make a careful study of the development of the edible crab, but stormy weather prevented us from completing our work, and we must wait for future opportunities to complete the observations which we were able to make this season.

Prof. Nunn studied the development of the Ctenophorae, especially Nemiopsis, and obtained interesting results regarding the changes which accompany the fertilization of the egg.

Besides working upon other subjects, Mr. Wilson carefully revised the change of the Actinotrocha into Phoronis. He succeeded in raising the Phoronis from the Actinotrocha, and in keeping it until all the adult characteristics were acquired, and he not only verified the results of previous writers, but also added many observations regarding the details of the process of transformation.

Most of my own time was spent in studying the development and artificial propagation of the oyster. I obtained information upon a number of obscure points in molluscan development, and I also reached very unexpected conclusions regarding the breeding habits of the American oyster. I have reason to believe that these investigations will prove to be of great economic importance.

I also succeeded in obtaining a very complete series of stages in the development of the Squid, and among other new points, I have detected the presence of a rudimentary velum in this group of Molluscs.

Owing to the uncertainties which attend work at the ocean, upon living animals, our unfinished investigations are much more numerous than those which were made sufficiently complete for publication, and the list given above does not, by any means, represent all our work

While we made no attempt to find or to describe new species, a few new representations of groups of especial interest have been sent to specialists on these groups for examination, and illustrated descriptions of some of them will soon be published.

Yours very truly,

W. K. BROOKS.

E.

Titles of Papers Presented to the Scientific and Literary Associations, 1878-79.

JOHNS HOPKINS PHILOLOGICAL ASSOCIATION.

PRINCIPAL PAPERS.

On the Special Province of the American Philologian. Oct. 4, 1878. By B. L. GILDERSLEEVE.
On the True Basis of Vowel-Classification. Nov. 1, 1878. By H. C. G. BRANDT.
On the Original Case-Form in Shemitic. Dec. 6, 1878. By T. C. MURRAY.
On the Bilingual Cypriote Inscription of Dali. Jan. 10, 1879. By A. D. SAVAGE.
On Ionic Forms in the Second Century, A. D. Feb. 7, 1879. By F. G. ALLINSON.
Lucian and Greek Philosophy. March 7, 1879. By E. G. SIHLER.
On the Words of Relationship in Indo-European. April 4, 1879. By M. BLOOMFIELD.
On the Relation of the Asinus of Lucian to the Metamorphoses of Apuleius. May 9, 1879. By C. D. MORRIS.

MINOR COMMUNICATIONS.

On Prof. Sauveur's "Natural Method" as used in the Normal School of Modern Languages. By L. RABILLON.
On Declined Words in Composition and some Results drawn from their Study. By M. BLOOMFIELD.
On Tentative Linguistic Forms and their Significance for a Question of Linguistic Philosophy. By C. R. LANMAN.
On Homer and Strabo. By E. G. SIHLER.
On the Introduction of Italian Literature—particularly that of Dante—into Hungary. By A. M. ELLIOTT.
On the Use of the Question in Lysias. By F. G. ALLINSON.
A Tabular Statement of the Cases of Agreement and Non-Agreement with Grimm's Law in the Words contained in the Gothic Version of St. Matthew's Gospel. By C. DAVIDSON, of Mitchellville, Iowa.
On the Coincidence of the Results of Grammatical Investigation with the Results of other Methods of Criticism, and on the Mutual Confirmation of the Results of Grammatical Criticism. By C. R. LANMAN.
On the Theory of Ross that Tacitus' History was written by Bracciolini. By C. D. MORRIS.
On Low-back-narrow-round Vowels as Pronounced by Foreigners. By H. C. G. BRANDT.
On the Etymologies of the Word *trouver*. By S. GARNER.
On the Latin Asseverative and Interrogative Particles. By M. WARREN, of the University of Bonn.
Attic Inscriptions of the Fifth Century B. C., referring to the Tribute of the Attic Confederation. By E. G. SIHLER.
On the Word "Copula" in Logic. By A. MARQUAND.
On Expressions for Time in Later Greek. By F. G. ALLINSON.

The average number of members present was about 20.

Historical and Political Science Association of the Johns Hopkins University.

Principal Papers.

The Stone Age. A Review of Recent Works on Prehistoric Archæology. By H. B. Adams.
A Study of German Social Democracy. By A. Marquand.
Primitive Aryan Mythology from the Standpoint of Indian Literature. By M. Bloomfield.
Methods of Historical Inquiry as Pursued at German Universities. By H. Von Holst.
Methods of Historical Instruction as Pursued at Brown University. By J. L. Diman.
Maryland's Ratification of the Federal Constitution. By A Scott.
The Problem for Political Economy in the United States. By H. C. Adams.

Minor Communications.

The Swiss Lake-Dwellings. By C. R. Lanman.
The Depopulation of Central Greece in the Post-Classical Period. By E. G. Sihler.
A Review of the Question, "Was Maryland a Roman Catholic Colony?" By H. B. Adams.
Recent Complications in the School System of New Haven. By D. C. Gilman.
Notes on Niebuhr's Life and Works. By E. G. Sihler.
Lieber's "Reminiscences of Niebuhr." By D. C. Gilman.
Animistic Religion an Excrescence, not a Germ, of Vedic Religion. By C. R. Lanman.
The Boundary Controversy between Maryland and Virginia. By E. Goodman.
The First Public Proposal of a Constitutional Convention for the United States. By A. Scott.
The Position of Socialism in the Historical Development of Political Economy. By H. C. Adams
Moral Insanity as a Cause of Crime. By C. W. Nichols.
Attic Colonization. By E. G. Sihler.

Scientific Association of the Johns Hopkins University.

Principal Papers.

The Work of the Chesapeake Biological School during the Summer of 1878. By H. Sewall.
Observations on the Light of the Corona during the last Solar Eclipse. By C. S. Hastings.
The Development of Lingula. By W. K. Brooks.
Some Recent Investigations in Chemistry. By I. Remsen.
A Problem of Isomerism. By F. Franklin.
A Method for the Preparation of Isopropyltoluol. By H. N. Morse.

Extract of a Letter from Professor Frankland, referring to the Experiments of Lockyer "on the Nature of the so-called Elements." By J. J. SYLVESTER.

The Effect of Changes of Interval of Stimulation on the Height of Tetanus. By H. SEWALL.

On Floating Magnets. By B. AYRES.

On Electric-Light Apparatus. By H. A. ROWLAND.

Toluolsulpho Acids and their Oxydation Products. By C. FAHLBERG.

The Motion of a Solid in a Mass of Frictionless, Incompressible Fluid. By T. CRAIG.

The Function of the Internal Intercostal Muscles. By E. M. HARTWELL.

Lockyer's Investigations in Relation to the so-called Elements. By C. S. HASTINGS.

An Apparatus for Gas Analysis. By A. V. E. YOUNG.

A New Determination of the Ratio of the Electro-Static and Electro-Magnetic Units. By E. H. HALL.

Degradation by Parasitism. By W. K. BROOKS.

Some Phenomena of Oxydation. By L. B. HALL.

Distribution of Heat in the Spectra of Various Substances. By W. W. JACQUES.

A Review of a Paper by Professor Sylvester "on a Method of Investigating Fluid Motion." By T. CRAIG.

A New Method for the Determination of the Dynamical Equivalent of Heat. By L. B. FLETCHER.

The Method of Locomotion in the Gasteropod Mollusks. By S. F. CLARKE.

The Influence of Increased Temperature on the Respiration of Animals. By C. SIHLER.

The Oxydation of Toluene-Disulphamide. By C. FAHLBERG.

A Brief Statement of the Work of the Year 1878-9 in the Chemical Laboratory. By I. REMSEN.

F.

List of Scientific Papers Published by Members of the University, 1876-79.

MATHEMATICS.

BY PROFESSOR SYLVESTER.

In the American Journal of Mathematics.

Application of the New Atomic Theory to the Graphical Representation of the Invariants and Covariants of Binary Quantics.

On Differentiants Expressed in Terms of the Differences of the Roots of their Parent Quantics.

Note on M. Hermite's Law of Reciprocity.

Completion of the Theory of Principal Forms.

Additional Illustrations of the Law of Reciprocity.

On the Principal Forms of the General Sextinvariant to a Quartic and Quartinvariant to a Sextic.

On the Probable Relation of the Skew Invariants of Binary Quintics and Sextics to one another and to the Skew Invariant of the same Weight of the Binary Nonics.

On Clebsch's "Einfachstes System associirter Formen" and its Generalization.

Note on the Ladenburg Carbon-graph.

Note on the Theorem contained in Prof. Lipschitz's Paper entitled "Demonstration of a Fundamental Theorem obtained by Mr. Sylvester" in Am. Jour. of Math., I, pages 336–341.

A Synoptical Table of the Irreducible Invariants and Covariants to a Binary Quintic, with a Scholium on a Theorem in Conditional Hyperdeterminants.

Notes on Determinants and Duadic Disynthemes. Two papers.

On the Complete System of the "Grundformen" of the Binary Quantic of the Ninth Order.

Tables of the Generating Functions and Groundforms for the Binary Quantics of the First Ten Orders.

On the Resolution of Numbers into the Sum or Difference of two Cubes.

In the Proceedings of the Royal Society, London.

The compiler of this list is informed that there are one or two communications by Professor Sylvester in the Proceedings of the Royal Society for 1878; but the Proceedings for that year are wanting in the Baltimore sets, and accordingly the titles cannot here be accurately stated.

In the Messenger of Mathematics, London.

Rule for Abbreviating the Calculation of the Number of In- or Co-Variants of a given Order and Weight in the Coefficients of a Binary Quantic of a given Degree. (1878).

Note on Continuants. (1878).

On a Theorem connected with Newton's Rule for the Discovery of the Imaginary Roots of Equations. (1879).

In the London, Edinburgh and Dublin Philosophical Magazine, London.

On a Generalization of Taylor's Theorem. (1877).

Proof of the Hitherto Undemonstrated Fundamental Theorem of Invariants (1878).

Note on an Equation of Finite Differences. (1879).

In the Educational Times, London.

Mathematical Questions for Solution, of an Original Character and embodying Distinct Theories, Monthly during the Years 1876–79, in Continuance of a Series, begun many years ago.

Journal für reine und angewandte Mathematik, (Crelle), Berlin.

Sur les actions mutuelles des formes invariantives dérivées. (1878).

Sur les déterminants composés. (1879).

Sur un déterminant symétrique qui comprend comme cas particulier la première partie de l'équation séculaire. (1879).

Note sur une propriété des équations dont toutes les racines sont réelles. (1879).

Sur l'entrelacement d'une fonction par rapport à une autre. (1879).

Preuve instantanée d'après la méthode de Fourier, de la réalité des racines de l'équation séculaire, (1879).

In the Comptes Rendus de l'Académie des Sciences de l'Institut de France.

Sur les invariants fondamentaux de la forme binaire du huitième ordre. (1877).

Sur une méthode algébrique pour obtenir l'ensemble des invariants et des covariants fondamentaux d'une forme binaire. (1877).

Sur une méthode algébrique pour obtenir l'ensemble des invariants et des covariants fondamentaux d'une forme binaire et d'une combinaison quelconque de formes binaires. (1877).

Sur le vrai nombre des covariants élémentaires d'un système de deux formes biquadratiques binaires. (1877).

Théorie pour trouver le nombre des covariants et des contrevariants d'ordre et de degré, donnés linéairement indépendants d'un système quelconque de formes simultanées, contenant un nombre quelconque de variables. (1877).

Sur les invariants. (3 papers.) (1877)

Sur la loi de réciprocité pour les invariants et covariants des quantics binaires. (1878).

Sur la théorie des formes associées de MM. Clebsch et Gordan. (1878).

Détermination d'une limite supérieure au nombre total des invariants et covariants irréductibles des formes binaires. (1878).

Sur les covariants fondamentaux d'un système cubo-quadratique binaire. (1878.)

Sur le vrai nombre des formes irréductibles du système cubo-biquadratique. (1878).

Détermination du nombre exact des covariants irréductibles du système cubo-biquadratique binaire. (1878).

Sur les covariants irréductibles du quantic du septième ordre. (1878).

Sur la forme binaire du septième ordre. (1878).

Sur la valeur moyenne des coefficients dans le développement d'un déterminant gauche ou symétrique d'un ordre infiniment grand et sur les déterminants doublement gauches. (1879).

Table des nombres de dérivées invariantives d'ordre et de degré donnés, appartenant à la forme binaire du dixième ordre. (1879).

Sur la valeur moyenne des coefficients numériques dans un déterminant gauche d'un ordre infiniment grand. (1879).

Sur une propriété arithmétique d'une certaine série des nombres entiers. (1879).

Sur le vrai nombre des covariants fondamenteaux d'un système de deux cubiques binaires.

BY DR. STORY.

In the American Journal of Mathematics.

On the Elastic Potential of Crystals.

Note on the Paper of MR. KEMPE, entitled the "Geographical Problem of the Four Colors," in the Am. Jour. of Math., II, 3.

By Dr. T. Craig.

Motion of a Point on the Surface of an Ellipsoid. (*Am. Jour. of Math*, *I*).

The Motion of a Solid in a Fluid. (*Am. Jour of Math*, *I*).

Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng Mag.*, *1879*).

General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst.*, *1879*).

Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math.*, *II*).

The Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math.*, *II*).

By Mr. F. Franklin.

Bipunctual Coordinates. (*Am. Jour. of Math.*, *I*).

On a Problem of Isomerism. (*Am. Jour. of Math.*, *I*).

Notes on Partitions of Numbers, etc. (*Am. Jour. of Math.*, *I*, *II*).

By Dr. G. B. Halsted.

Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math.*, *I*).

Note on the First English Euclid. (*Am. Jour. of Math*, *I*).

By Miss Christine Ladd.

Quaternions. (*Analyst*, *1877*).

The Polynomial Theorem. (*Analyst*, *1878*).

On some Properties of Four Circles Inscribed in One and Circumscribed about Another. (*Analyst*, *1878*).

On Pascal's Hexagram. (*Am. Jour. of Math.*, *II*).

By Mr. W. I. Stringham.

Some General Formulae for Integrals of Irrational Functions. (*Am. Jour. of Math.*, *II*).

The Quaternion Formulae for Quantification of Curves, Surfaces and Solids and for Barycentres. (*Am. Jour. of Math.*, *II*).

PHYSICS.

By Professor Rowland.

The Magnetic Effect of Electrical Convection. (*Am. Jour. of Science*, *1878; abstract by Helmholtz in Monatsbericht d. Berlin Akad*).

Research on the Absolute Unit of Electrical Resistance. (*Am. Jour. of Science*, *1878*).

Note on the Theory of Electric Absorption. (*Am. Jour. of Math.*, *1878*).

On Professor Ayrton and Perry's New Theory of the Earth's Magnetism, with a Note on a New Theory of the Aurora. (*Philos. Mag.*, *1879*).

Note on the Magnetic Effect of Electrical Convection. (*Philos. Mag., 1879*).

On the Diamagnetic Constants of Bismuth and Calc-Spar in Absolute Measure, part I. (*Am. Jour. of Science, 1879*).

On the Mechanical Equivalent of Heat, with Subsidiary Researches on the Variation of the Mercurial from the Air Thermometer, and on the Variation of the Specific Heat of Water. (*Amer. Acad., Boston, in press*).

BY DR. HASTINGS.

The Influence of Temperature on the Optical Constants of Glass. (*Am. Jour. of Science, 1878*).

On Lockyer's Hypothesis, that the so-called Elements are Compound Bodies. (*Am. Chem Jour., 1879*).

On the Perfect Color Correction in Triple Objectives. (*Am Jour. of Science, 1879*).

BY DR. W. W. JACQUES.

Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. of Franklin Inst., 1878; Philos. Mag., 1879*).

Velocity of Very Loud Sounds. (*Am. Jour. of Science, 1879; Philos. Mag., 1879*).

Diamagnetic Constants of Bismuth and Calc-Spar Crystals in Absolute Measure, part II. (*Am Jour of Science, 1879*).

Distribution of Heat in the Spectra of Various Sources of Radiation. (*Am. Acad., Boston, 1879*).

BY MR. E. H. HALL.

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math., 1879*).

CHEMISTRY.

1. Zur Kentniss des Phosphoroxychlorids. By IRA REMSEN. (*Berichte der deutschen chemischen Gesellschaft, 1876*).

2. Ueber die Xylolsulfamide. By IRA REMSEN. (*Berichte, &c., 1877*).

3. Ueber die Oxydation der Mesitylensulfosäure. By IRA REMSEN and L. B. HALL. (*Berichte, &c., 1877*).

4. Ueber die isomeren Sulfosäuren aus Paranitrotoluol. By IRA REMSEN and E. HART. (*Berichte, &c., 1877*).

5. Ueber die Oxydation der Sulfosäuren des Metaxylols. (By IRA REMSEN and M. W. ILES. (*Berichte, &c , 1877*).

6. Ueber Xylolsulfamide By IRA REMSEN. (*Berich'e, &c., 1878*).

7. Ueber Chlorcymol aus Thymol u. s. w. By IRA REMSEN. (*Berichte, &c., 1878*).

8. Nichtexistenz einer zweiten Dioxybenzoesäure aus Disulfobenzoesäure. By IRA REMSEN. (*Berichte, &c , 1878*).

9. Oxydation der Xylolsulfosäuren. By IRA REMSEN and M. W. ILES. (*Berichte, &c., 1878*).

10. Oxydation der Xylolsulfamide. By IRA REMSEN and M. W. ILES. (*Berichte, &c., 1878*).

11. Neue Bildungsmethode der *a*-Oxyisophthalsäure. By IRA REMSEN and M. W. ILES. (*Berichte, &c., 1878*).

12. Oxydation des Bromäthyltoluols und ähnlicher Substitutionsprodukte. By IRA REMSEN and H. N. MORSE. (*Berichte, &c., 1878*).

13. Neue Methode zur quantitativen Bestimmung von Schwefel. By C. FAHLBERG and M. W. ILES. (*Berichte, &c., 1878*).

14. Neue Darstellungsmethode der Acetylamidophenole. By H. N. MORSE. (*Berichte, &c., 1878*).

15. Ueber die Oxydation des Orthotoluolsulfamids. By C. FAHLBERG and IRA REMSEN. (*Berichte, &c., 1879*).

16. On the Oxidation of Aromatic Substitution-products. By IRA REMSEN. (*Am. Chem. Jour., 1879*).

17. On the Oxidation of Xylenesulphamides. By IRA REMSEN and M. W. ILES. (*Am. Chem. Jour., 1879*).

18. On the Oxidation of Bromparaethyltoluene. By IRA REMSEN and H. N. MORSE. (*Am. Chem. Jour., 1879*).

19. An Apparatus for Gas Analysis. By A. V. E. YOUNG, (*Am. Chem. Jour., 1879*).

20. On the liquid Toluenesulphochloride. By C. FAHLBERG. (*Am. Chem Jour., 1879*).

21. Ueber Oxydationsprodukte aus Xylolsulfamid. By L. B. HALL and IRA REMSEN. (*Berichte, &c., 1879*).

22. Ueber die Anhydrosulfaminisophthalsäure. By IRA REMSEN and R. D. COALE. (*Berichte, &c., 1879*).

This list does not include some addresses and semi-popular articles which have been published.

BIOLOGY.

1. The Effect of Stimulation on an Excised Nerve. By WILLIAM LEE, M. D. (*New York Medical Record*).

2. Report on the Hydroids of Alaska. By S. F. CLARKE. (*Scientific Results of Exploration of Alaska. Smithsonian Institution*).

3. *Normal Respiratory Movements of the Frog and the Influence upon its Respiratory Centre of Stimulation of the Optic Lobes. By H. N. MARTIN. (*Journal of Physiology, Vol. I, Nos. 2 and 3*).

4. *The Development and Regeneration of the Gastric Glandular Epithelium during Fœtal Life and after Birth. By HENRY SEWALL. (*Journal of Physiology, Vol. I, Nos. 4 and 5*).

5. Report on the Hydroids Collected in the Exploration of the Gulf Stream and the Gulf of Mexico. By S. F. CLARKE. (*Bull. Mus. Comp. Zoöl., Cambridge*).

6. On the Development of the Smelt. By H. J. RICE. (*Report Maryland Fish Commission, 1878*).

7. *The Influence of Stimulation of the Midbrain upon the Respiratory Rhythm of the Mammal. By H. NEWELL MARTIN and W. D BOOKER, M. D.

8. *The Botanical Relations of Trichophyton Tonsurans. By I. EDMUNDSON ATKINSON, M. D. (*New York Medical Journal, Dec., 1878*).

9. *† Preliminary Observations on the Development of Marine Prosobranchiate Gasteropods. By W. K. BROOKS.

10. †The Larval Stages of Squilla Empusa. By W. K. BROOKS.

11. †The Development of Lingula and the Systematic Position of the Brachiopoda. By W. K. BROOKS.

12. On the Development of the Shad. By H. J. RICE. (*Report Maryland Fish Commission, 1878*).

13. On the Respiratory Function of the Internal Intercostal Muscles. By H. N. MARTIN and E. M. HARTWELL. (*Journal of Physiology, Vol. II, No. 1*).

14. Observations on the Physiology of the Spinal Cord. By ISAAC OTT, M. D. (*Journal of Physiology. Vol. II, No. 1*).

15. On the Effect of Two Succeeding Stimuli upon Muscular Contraction. By HENRY SEWALL. (*Journal of Physiology. Vol. II, No 2*).

16. On the So-called Heat-Dyspnœa. By CHRISTIAN SIHLER, M. D. (*Journal of Physiology, Vol. II, No. 3*).

17. †List of animals found at Fort Wool. By P. R. UHLER.

Semi-popular articles are excluded from this list, which contains only papers based on original researches or observations made in the Laboratory of the University or its summer marine offshoot, the Chesapeake Zoölogical Laboratory. A considerable portion of the work of the session 1878-79 is not yet published.

*The papers marked with an asterisk were re-printed in a volume of "Studies from the Biological Laboratory, Session 1877-78," published by Murphy & Co., Baltimore. A similar volume for the session 1878-79 is nearly ready.

†The papers marked † were published in a volume containing the results of the work at the Marine Laboratory at Fort Wool in the summer of 1878. This volume also contained the following papers based on observations or collections made at the Summer Laboratory, but not written by members of the University—

Land Plants found at Fort Wool. N. B. Webster.

Lucifer typus. Walter Faxon.

PHILOLOGY.

BY PROFESSOR GILDERSLEEVE.

Justin Martyr. Apologies, and Epistle to Diognetus. Ed. with introduction and notes. N. Y., 1877.

On εἰ with the Future Indicative and ἐάν with the Subjunctive in the Tragic Poets. (*Amer. Philol. Assoc., Trans., 1876*).

Personal Reminiscences of Friedrich Ritschl. (*Amer. Philol. Assoc., Proc., 1877*)..

Contributions to the History of the Articular Infinitive in Greek. (*Amer. Philol. Assoc., Trans., 1878*).

Encroachments of μή upon οὐ in Later Greek. (*Am. Philol. Assoc., Proc , 1879*).

Classics and Colleges. (*Princeton Review, 1878*).

University Work in America. (*Princeton Review, 1879*).

BY MR. H. C. G. BRANDT.

The Roman Alphabet in German. (*Amer. Philol. Assoc., Proc., 1878*).

BY MR. A. S. COOK.

Studies in the Heliand. (*Amer. Philol. Assoc., Proc., 1879*).

BY DR. C. R. LANMAN.

Noun-Inflection in the Veda. (*Am. Or. Soc., Jour., Vol. X, pp. 325-615*).

Compendium of Sanskrit Paradigms. (1876).

A Conjectural Emendation of Rig-Veda i. 30. 11. (*Am. Or. Soc., Proc., 1877*).

On Tentative Linguistic Forms and their Significance for a Question of Linguistic Philosophy. (*Am. Or. Soc., Proc., 1878*).

BY MR. T. C. MURRAY.

The Home of the Shemitic Peoples. (*Am. Or. Soc., Proc., 1878*).

The Original Case-Form in Shemitic. (*Am. Or. Soc., Proc., 1878*).

Hebrew Synonyms (a book left in manuscript).

Lectures on the Poetical Books of the Old Testament. (*N. Y., 1879, in press.*)

BY MR. A. D. SAVAGE.

The "Oath of Rhadamanthus." (*Am. Philol. Assoc., Proc., 1878*).

BY DR. E. G. SIHLER.

The Historical Aspect of the Old Attic Comedy. (*Am. Philol. Assoc., Proc., 1876*).

On Herodotus's and Æschlyus's Accounts of the Battle of Salamis. (*Am. Philol. Assoc., Trans., 1877*).

The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Am. Philol. Assoc, Proc., 1879*).

HISTORY AND POLITICAL SCIENCE.

BY DR. H. C. ADAMS.

Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode 1789–1816. (*Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen, 1879*).

Cooperation. (*Am. Soc. Sc. Assoc., 1878*).

Historical Position of Socialism in the Development of Political Economy. (*Penn. Monthly, 1879*).

BY DR. H. B. ADAMS.

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Hist. Soc., 1877*).

The foregoing lists do not include the papers of any writer published previous to his connection with this institution, or after he left it; and it omits light articles and those of a merely transient interest. It does not include the papers of non-resident lecturers.

G.

List of Donors to the Library, September 1, 1878, to September 1, 1879.

AMERICAN INSTITUTE OF MINING ENGINEERS. Transactions. Phila. and Easton, Pa. 1871–8. 6 vols. O.

B. BONCOMPAGNI, (through Professor Sylvester.) Bollettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche. Roma, 1868–78. 11 vols. F.

CENTENNIAL BOARD OF FINANCE. Report of the International Exhibition, 1876. Phila., 1878–9. 11 vols. O.

Prof. A. JAY DU BOIS, Ph. D. (The Translator.) Mechanics of Engineering, by J. Weisbach. Vol. 2d. New York, 1878. O.

Prof. E. FRANKLAND, F. R. S. (The Author.) Experimental Researches in Pure, Applied, and Physical Chemistry. London, 1877. O.

Hon. JOHN W. GARRETT. Elements and Manual of Botany, by John Hutton Balfour. Edinburgh, 1875–6. 2 vols. D.

Guide to Royal Botanic Gardens, Edinburgh, by John Hutton Balfour. Edinburgh. D.

Open Air Vegetation, by James McNab. Edinburgh, 1876–7. 2 vols. O.

GEORGE L. HARRISON. (The Author.) Social Science in relation to State Charities. Phila., 1877. O.

Prof. JAMES A. HARRISON. (The Author.) Greek Vignettes. Boston, 1878. S.

Gen. A. A. HUMPHREYS, Chief of Engineers, U. S. A. U. S. Geological Exploration of 40th Parallel. Vol. I.

Systematic Geology, by Clarence King. Washington, 1877. Q.

Annual Report of the Chief of Engineers to the Secretary of War, for 1878. Washington, 1879. 3 vols. Q.

Hon. JOHN JAY KNOX. Annual Reports of the Comptroller of the Currency. Washington, 1876–8. 2 vols. O.

Hon. F. C. LATROBE, Mayor of Baltimore. Mayor's Message and Reports of the City Officers, for the year 1878. Baltimore, 1879. 2 vols. O.

Hon. GEORGE H. MOORE, LL. D. (The Author.) Notes on the History of Slavery in Massachusetts. New York, 1866. O.

Treason of Maj. Gen'l Charles Lee. New York, 1860. O.

Mrs. CHARLES PICKERING. Chronological History of Plants, by Charles Pickering, M. D. Boston, 1879. Q.

Mrs. BURR PORTER. (In continuance of former gifts commemorative of P. Porter Poinier, a Fellow of this University.) Théorie Mécanique de la Chaleur, par R. Clausius, trad. de l' allemand par F. Folie. Paris, 1868–9. 2 vols. D.

Recent Discussions in Science, Philosophy and Morals, by Herbert Spencer. New York, 1871. O.

Treatise on Magnetism, by George Biddell Airy. London, 1870. D.

Expériences sur les Machines à Vapeur, par M.V. Regnault. Paris, 1847–70. 3 vols. Q.

Mécanique Analytique, par J. L. La Grange, rev. par M. J. Bertrand. Paris, 1853. Q.

Théorie Mathématique de la Chaleur, par S. D. Poisson. Paris, 1835. Q.

Treatise on the Steam Engine in its various applications, by John Bourne. 9th ed. New York, 1872. Q.

Rear Admiral JOHN RODGERS, U. S. N. Astronomical and Meteorological Observations made at the U. S. Naval Observatory, Washington. Washington, 1847–78. 27 vols. Q.

SMITHSONIAN INSTITUTION. Miscellaneous Collections. Washington, 1862–78. 6 vols. O.

Documents Relative to its Origin and History, ed. by W. J. Rhees. Washington, 1879. O.

Mrs. JARED SPARKS. Notes on the State of Virginia, by Thomas Jefferson. Philadelphia, 1825. O.

UNITED STATES DEPARTMENT OF THE INTERIOR. U. S. Geological and Geographical Survey of the Territories. Washington. 35 vols. Q. and O.

UNITED STATES WAR DEPARTMENT. History of the War Department of the United States, by L. D. Ingersoll. Washington, 1879. O.

ADDITIONAL GIFTS OF BOOKS AND PAMPHLETS HAVE BEEN RECEIVED AS FOLLOWS:

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FIFTH ANNUAL REPORT

OF THE

JOHNS HOPKINS UNIVERSITY,

Baltimore, Maryland.

1880.

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OF THE

Johns Hopkins University,

Baltimore, Maryland,

1880.

BALTIMORE:
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET.
1880.

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FIFTH ANNUAL REPORT

OF

THE PRESIDENT.

To the Trustees of the
Johns Hopkins University:

GENTLEMEN:

In presenting to you the Fifth Annual Report of our University, it is necessary to bear in mind that printed copies of it are likely to fall into the hands of those who may not have seen the preceding issues and I therefore ask leave to go over the experience of previous years as I bring before you an account of the year just closed.

We have now concluded the first four years of instruction in the Johns Hopkins University. Within this period 295 persons have been enrolled among us as students, including graduate, undergraduate and special students,—but not including the attendants upon public lectures, or upon the courses designed exclusively for teachers, and for members of the medical profession. The under-

graduate students have come chiefly from Baltimore and its neighborhood. The graduate and special students have come from almost every State in the Union,—and to a very limited extent from beyond its borders. Of these, 165 had taken an academic degree before coming to us.

The following table shows the attendance, in each of the past four years:

1876–77,	89,	of whom	54	were	graduates,	35	not graduated.
1877–78,	104,	"	58	"	"	46	" "
1878–79,	123,	"	63	"	"	60	" "
1879–80,	159,	"	79	"	"	80	" "

A.

RECAPITULATION OF FORMER STATEMENTS.

Among the special features apparent in our plans it may be worth while to recapitulate the following:

1. ***The Faculty of Philosophy.*** Literature and science have been encouraged with equal heartiness. While on the one hand we have endeavored to promote original researches in Mathematics, Physics, Chemistry, and Biology, we have also made liberal provision for the study of the philological and historical sciences.

We have carefully avoided all tendencies toward the formation of a scientific faculty, department, or school, face to face with a classical or literary department,—and have aimed to regard all the branches of learning which have here been taught

as properly coördinated in one department of Philosophy and the Arts. Although much thought has been given to professional instruction, particularly in Medicine, no steps have as yet been taken in that direction.

So far as the scholars are concerned, the effort has been made to impress upon them all, that the theory of liberal education requires that every one who expects to follow scientific pursuits should supplement his special studies with a good training in the use of language,—and in addition to a knowledge of his own tongue, should become acquainted with Latin, and with two or more of the modern languages of Europe; and likewise that every one who expects to engage in a literary calling should be familiar with the methods which are followed and the reasoning which is employed in the prosecution of modern science. Accordingly in every scheme of study which we have proposed, and in every examination for a degree, we have insisted that both literature and science should be included. The careful study of our announcements will show this aim; while with an increasing staff and with enlarged experience we may hope in the future to be even more successful than we have been in the past.

2. ***The Advancement and Publication of Researches.*** We believe that it is one of the noblest

duties of a University to advance knowledge, and to diffuse it not merely among those who can attend the daily lectures of the professors, but far and wide. Consequently, in the selection of instructors,—the younger as well as the older,—we have endeavored to choose those who may still be students while they are teachers, investigators in their several departments of learning, disposed to add their contributions to the sciences they profess to teach. We have not only selected those who are capable of carrying forward researches, but we have endeavored to keep them so free from the petty interruptions of an ordinary academic life and from its excessive burdens that they have had time at their command for the prosecution of study. Liberal provision has been made of apparatus and instruments, of books and journals, new and old,—so that the work here performed may be quite in harmony with the investigations which are carried on in older institutions and in other lands. Publication has been encouraged,—so far as possible through the channels already established,—but when necessary through agencies of our own. We have not instituted a university press,—but we have made arrangements for the systematic printing of mathematical, chemical, biological and philological papers, and in a less formal way for the announcement in our circulars of the work which

is done in all the university departments. We have hoped in this way to extend the usefulness of this foundation far beyond the company of those whom we constantly instruct.

3. ***University Students.*** We have been aware that there are large numbers of young men in this country who desire to carry on their education beyond what are commonly known as the collegiate or academic courses, without at once entering upon the study of the learned professions; and we have arranged our courses so that all who enter our walls for this purpose, may have ample assistance and encouragement adapted to their personal requirements. Many of these advanced students desire to become professors and teachers, and a very considerable number have already gone out from among us to positions of honor and usefulness in other institutions of learning,—so that in this aspect, our foundation may be regarded as a seminary of teachers. Others are training themselves for scientific callings which are practical rather than academic, demanding the most exact knowledge and the most skilful methods. Some who had already entered upon professional life, have come to us to fill up such deficiencies in their training as we are able to supply. The number of physicians, for example, who have shown a desire to become acquainted with the modern methods of physiological inquiry as taught in our laboratory, is

quite large,—and so the number of clergymen who have come to us for instruction in languages, is noteworthy. Another group of students consists of young men of wealth and social standing, who are not inclined to follow professional life,—but who are earnestly pursuing advanced and difficult courses of study, that they may be well prepared to do their part, whatever may be the position as writers, speakers, teachers, or leaders in public affairs hereafter open to them.

From these various classes we have formed a company consisting last year of seventy scholars, who had already taken an academic degree, a company large enough to exhibit great diversities of talent, training, and aspiration, and also to afford companionship in study to men whose pursuits are very special. The requirements of such students have constantly been thought of in the development of our plans, and as the attractions which Baltimore is able to offer, not only within our walls, but in the other literary and scientific foundations of the city, become better known, we look for a constant, if not a rapid, accession to their numbers.

4. ***Collegiate Students.*** We have thought from the outset, that the youth of Baltimore and the adjacent region, had peculiar claims upon this University,—for our founder was a Baltimore merchant who gave his fortune to build up in

this place the institutions of charity and of education. His gifts were too generous to be restricted by any geographical consideration and they are administered in a most liberal spirit; at the same time it would not be reasonable that the boys of Baltimore should be obliged to go away from the city of their residence in order to secure the requisite preparation for university work. It would indeed be an excellent thing if some liberal citizen would found a college or hall in connection with this University, to bear his own name, and to afford on a liberal plan, under appropriate regulations, collegiate education. A kindred foundation for the education of young women is also much to be desired. But for the present, it is possible for the Johns Hopkins University, by the addition of a few teachers, to provide collegiate courses leading to the degree of Bachelor of Arts; and in most respects to do quite as much for those who enter upon these courses as is done in any college for students of like standing. Some of the peculiar advantages of the collegiate part of our work may be discovered by a scrutiny of our registers and programmes.

5. ***Public Lectures.*** Our work has been prosecuted not only by the instruction of young men, and by the publication of scientific papers, but by courses of lectures annually given in Hopkins

Hall to which the educated public are admitted, with only the limitations which the capacity of the hall imposes. A great variety of scientific, literary, historical and philosophical themes have been discussed in these lectures by the members of our own academic staff, and by other gentlemen of distinction from a distance. Several series of Saturday lessons designed exclusively for teachers have also been given, and special courses in physiology have been offered to medical students connected with the professional schools in Baltimore. Among incidental services may be mentioned the delivery of popular addresses on literary and scientific themes before audiences brought together in Canton and other suburban districts, somewhat after the plan of penny-readings which are so useful in England. By responding to calls for these and kindred services, in different parts of the city, the members of the University have shewn their readiness to contribute to the general intellectual enjoyment and progress of the community.

6. ***Bestowal of Degrees.*** While we have endeavored to extend the influence and even the instructions of the University to a wide circle, we have determined to bestow our honors with a very careful hand. The standard of matriculation has been placed at a higher point than is common in the institutions of this country;

the examinations for admission and promotion have been carefully conducted and accurately recorded; to a very considerable extent in undergraduate classes, two papers have been set, one by the teacher of the class, and the other by an independent examiner; in the final tests for the degree of Doctor of Philosophy, scholars who are experienced in teaching and who are connected with other institutions of learning, have often lent their aid in the careful scrutiny of the graduating theses, and sometimes in the oral examination of the candidates. We have conferred one honorary degree.

7. ***Books and Apparatus.*** The purchase of books and apparatus has been permitted upon a liberal scale, and in accordance with the requests which have been preferred by the principal workers in the various departments. Our collections are to be judged not so much by their extent as by their adaptation to our needs. The list of instruments designed for exact measurements was printed in our last report, and since that time important additions have been made. The amount already expended for books and periodicals is $26,081.71 and for apparatus, $32,151.01.

B.

RESULTS OF THE FOURTH YEAR.

GENERAL STATEMENTS.

From this general review of the considerations by which we have been governed, I proceed to bring before you some figures which may shew our circumstances at the close of a fourth year.

In the annual session, lately brought to a close, there have been no radical changes. We can look back upon another period of satisfactory progress, free from any interruption of the harmony, order, and devotion to study which have hitherto marked our associated life. We are encouraged to believe that the methods of academic work here followed are approved by many of the most enlightened teachers of this and other lands. Every year brings within our doors a large number of officers of colleges and universities who are interested in this foundation, and the call for our circulars and reports comes from widely separated States and countries. The professors and associates of the University continue to set the example of devotion to the discovery and diffusion of knowledge, and they have never been more successful than within the past year. The corps of Fellows maintains its high character, and includes as heretofore a score of

well trained scholars, nearly or quite ready to enter upon positions of usefulness in literary and scientific institutions. About one-half of our students continue to come from the State of Maryland and the other half are drawn from the other States of the Union, with a slowly increasing number from the South and West, and with a small accession from countries beyond the territory of the United States. Not far from one-half of those enrolled upon our lists have already been admitted to academic degrees,—most of the remainder are candidates for the degree of B. A., while a few have been received as special students, without reference to graduation. The scientific and literary courses which we offer, appear to be taken with equal avidity. The conduct of the students has been without reproach,—not a single member of the University having been censured for disorder since our doors were opened. There is an increasing desire to win the honor of an academic degree and we graduated the last year sixteen Bachelors of Arts, and five Doctors of Philosophy. The afternoon lectures continue to draw large companies of hearers. The scientific publications of the University have been increased by the publication of a Journal of Philology. The printing in occasional quarto numbers of our official circulars has been commenced, and six numbers were issued within the last year.

PERSONAL CHANGES.

The staff of Instructors was augmented at the beginning of the year by the appointment of Professor Charles S. Peirce, of the U. S. Coast and Geodetic Survey, to be a Lecturer on Logic, and of Mr. Sidney Lanier to be a Lecturer on English Literature. Mr. Alexander Graham Bell, to whom the Volta Prize has been awarded by the French government for his discoveries, has accepted an invitation to join our staff as a Lecturer on Phonology. Professor J. Willard Gibbs has delivered a course of lectures on Rational Mechanics, to advanced students in Mathematics. Dr. Thomas Craig, of the U. S. Coast and Geodetic Survey, has continued to lecture on certain mathematical subjects, and Dr. H. C. Adams has given and will give instruction in Political Economy. Professor G. S. Morris continues to lecture on the History of Philosophy and on Ethics,—and Professor Diman of Brown University has consented to lecture again during the coming winter. A short course on the Philosophy of Physics was given by Professor John Trowbridge.

The corps of Associates has been increased by the appointment of Dr. Minton Warren, in Latin, and of Mr. A. S. Cook in English,—both of whom have rendered efficient services during the past year. Dr. Wm. Hand Browne entered upon the office of Librarian at the beginning of the session,

and discharges the duties with ability and fidelity. Dr. H. Sewall, formerly a Fellow and an Assistant in Biology, has returned to this country after a period of study in European laboratories, and now takes the place of an Associate in Biology. Dr. C. R. Lanman, who entered the University as a Fellow in 1876 and was for the past three years an Associate, has accepted a call to the professorship of Sanskrit in Harvard University and leaves us with the respect and good will of all who have known his talents and learning. Dr. L. B. Hall, Assistant in Chemistry, has been called to the professorship of Chemistry and Physics at Haverford College, and now enters upon the duties of his new position simultaneously with Dr. Allinson, who goes to the chair of Greek. Mr. W. T. Sedgwick, lately a Fellow, has been made an Assistant in Biology, and Dr. E. H. Hall, also a Fellow for the last two years, becomes an Assistant in Physics. Mr. Stockbridge, lately an instructor in Amherst College, joins us as a teacher of Latin and German.

Attendance.

The attendance during the year 1879–80, was as follows:

Enrolled Students.

Fellows,	20
Other Graduates,	59
Matriculates,	32
Non-Matriculates,	48
	159

Unenrolled Students.

Teachers Class in Early English,	20
Teachers Class in Theory of Numbers,	24
Medical Students, in Animal Physiology,	16
Medical Students, in Microscopic Anatomy,	4
Chesapeake Zoölogical Laboratory in 1879,	10
Chesapeake Zoölogical Laboratory in 1880,	6
Sea Side Class (at Fort Wool, Va.) in 1880,	8
Special, in History,	6
Special, in New Testament Greek,	5

Average Attendance upon Public Lectures:

English Verse,	170
French Epic Poetry,	57
Biology,	73
Philosophy of Physics,	142
Italian Renaissance,	212
The Vedas,	151
Greek Tragic Poets,	114
History of Philosophy,	123
French Literature,	47
National Debts,	41

CLASSES, SOCIETIES, LABORATORIES, AND PUBLICATIONS.

From various statements which are printed in the Appendix, the character of the instruction which has been given during the past year, as well as some idea of the lines of investigation which have been followed by many of the members of the academic staff, may be clearly ascertained. It will be seen that during the year classes have been organized and taught in the following branches of science:

MATHEMATICS:

Theory of Numbers,
Elliptic Functions,
Solid Analytic Geometry,
Calculus of Variations,
Cylindric or Bessel's Functions,
Differential and Integral Calculus,
Theory of Equations.
Quaternions,
Higher Plane Curves,
Differential Equations,
Spherical Harmonics,
General Theory of Functions,
Conic Sections,

PHYSICS:

Thermodynamics,	Electricity and Magnetism,
Theory of Heat Conduction,	Rational Mechanics,
General Physics.	

CHEMISTRY:

Organic Chemistry,	Analytical Chemistry,
General Chemistry.	

BIOLOGY:

Animal Physiology,	Animal Morphology,
Osteology, Human and Comparative,	Histology,
General Biology.	

The Laboratories of the University are three in number, and are open during the academic year from September to June, with the exception of a few holidays. They are devoted to Chemistry, Physics, and Biology.

During the warm months a zoölogical station is maintained on the sea-board under the name of the "Chesapeake Zoölogical Laboratory." This was stationed on the Chesapeake in the summer of 1878, and again in 1879, and has been maintained during the recent academic year at Beaufort, N. C., south of Cape Hatteras. Dr. W. K. Brooks has continued to be the director, and the results of his able researches, and those of his coädjutors, will be printed. One of the Fellows in Biology, Mr. E. B. Wilson, was with him during the entire season; another one of our Fellows, Mr. Mitsukuri, and three other scientific collaborators were there for a considerable period. A

statement of the reasons for selecting Beaufort as a station and many details in respect to the observations which have been made during the season will be found in a communication by Dr. Brooks appended to this report.

The distance of Beaufort from Baltimore was so great that only a few persons availed themselves of the facilities there afforded. Partly on this account, and partly to meet the requirements of beginners in sea-side studies, Dr. S. F. Clarke, at first on his own responsibility, but afterwards with the pecuniary assistance of the University, volunteered to guide the work of an elementary class at Fort Wool, the site at the mouth of the Chesapeake, where, for two previous seasons, the Chesapeake Laboratory had been stationed. Permission to use the government buildings at that station was accorded by the Secretary of War, on the recommendation of Gen. Q. A. Gillmore, U. S. A., to whom again the thanks of the University are due. The number of scholars in attendance was seven.

The class instruction in language, history, and philosophy pertained to the following authors and subjects:

SANSKRIT:

Rig and Atharva Vedas,	Advanced and Elementary Classes.

GREEK:

Pindar,	Aristophanes,
Greek Lyric Poetry,	Aristotle, *Rhetoric*,

GREEK: (*Continued.*)

Plato, *Gorgias; Meno,*
Lysias, *four orations,*
Select Readings in the Tragedies,
Composition and Translation,
Homer, *Odyssey,*
Isocrates, *two orations,*
New Testament,
Syntax.

LATIN:

Plautus,
Lucretius, *three books,*
Livy, *two books,*
Historical Latin Grammar.
Terence, *two plays,*
Horace,
Latin Prose Composition,

TEUTONIC LANGUAGES, (including German and English):

Gothic, *Ulfila,*
Middle High German, *Nibelungenlied, etc.*
Ballads, *Lectures,*
Goethe, *Faust,*
Lessing, *Nathan der Weise,*
Humboldt, *Ansichten der Natur,*
Schiller, etc.,
Old Saxon, *Heliand,*
Anglo Saxon, *two classes,*
Anglo Saxon Laws,
Early English,
Chaucer,
Shakespeare, *two classes,*
Exercises in writing.

ROMANCE LANGUAGES, (including French, etc).

Provençal,
Old French, *Chanson de Roland, Villehardoin,* etc.
Wallachian,
Modern literary and scientific authors.

HISTORY AND POLITICAL SCIENCE:

Modern History, *Renaissance* and *Reformation,*
English Constitutional History, *Stubbs' Charters,*
Comparative Constitutional History,
Political Economy,
Special Course in Money and Banking.

LOGIC:

Mediaeval Logic,
Probabilities,
Mathematical Logic,
Mill's Logic.

HISTORY OF PHILOSOPHY:

British Philosophy,
German Writers on Aesthetics.
Ethics,

Classes have also been taught in Physiography, Drawing, Elocution, etc.

Public lectures have been given during the year in Hopkins Hall, as follows:*

*Two of these courses—those by Mr. Lanier and by Professor G. S. Morris,—have been printed. M. Rabillon lectured in French.

Subject.	Lecturer.	Average Attendance.
English Verse, (16),	Sidney Lanier,	170
French Epic Poetry, (12),	L. Rabillon,	57
Readings in Corneille, Molière, etc., (12,)	L. Rabillon,	47
Philosophy of Physics, (12),	John Trowbridge,	142
Italian Renaissance, (10),	H. B. Adams,	212
The Vedas, (6),	C. R. Lanman,	151
Greek Tragic Poets, (9),	B. L. Gildersleeve,	114
British Thought and Thinkers, (12),	G. S. Morris,	123
Recent Studies of the Crab and Oyster, (3),	W. K. Brooks,	73
On National Debts, (9),	H. C. Adams,	41

For the guidance of advanced students various plans differing both from lectures and classes have been employed. In Greek, Professor Gildersleeve maintains a seminary akin to those of the German universities, which has met twice a week during the last year, and has been chiefly devoted to the study of Aristophanes. The special students in Mathematics meet once a month under the direction of Professor Sylvester and Dr. Story, for the presentation and discussion of mathematical papers. Dr. Hastings has met a class in Physics every Saturday, for the discussion of problems, and the criticism of results. There are three companies which have held weekly meetings for the reading of scientific journals,—Chemical, Physical, and Biological.

Five associations have met frequently for the presentation of scientific and literary papers. Abstracts of some of the more important contributions have been given in the University Circulars.

These societies are:

1. The Scientific Association, meeting under the presidency of Professor SYLVESTER.
2. The Philological Association, meeting under the presidency of Professor GILDERSLEEVE.
3. The Historical Association of which Dr. H. B. ADAMS is the secretary.
4. The Metaphysical Club of which Professor C. S. PEIRCE, is the head.
5. A Naturalists' Field Club, organized under the leadership of Professor MARTIN.

Four scientific journals are published under the auspices of the University. Their principal contents are stated in the Appendix.

1. The American Journal of Mathematics, published quarterly under the editorial control of Professor SYLVESTER, with the aid of Dr. STORY. Nine numbers have been printed, and two numbers are nearly ready.
2. The American Chemical Journal, published six times in the year, under the editorial control of Professor REMSEN. The second volume is nearly complete.
3. The American Journal of Philology, edited by Professor GILDERSLEEVE, the publication in his temporary absence having been supervised by Professor C. D. MORRIS. Three numbers have appeared, and the fourth is in press.
4. The Studies from the Biological Laboratory, partly printed here for the first time, and partly contributed to the Cambridge Journal of Physiology, have been collected in one octavo volume of 500 pages, with 40 plates. The editorial supervision was in the hands of Professor MARTIN, with the coöperation of Dr. W. K. BROOKS.

COMMEMORATION DAY; DEGREES BESTOWED.

The twenty-third of February, 1880, was observed as our fifth commemoration day. After opening statements on the part of the Faculty and the Trustees, candidates for the degree of Bachelor of Arts were presented by Professor C. D. Morris; and a candidate for the degree of Doctor of Philosophy was presented by Professor Sylves-

ter. Hon. C. J. M. Gwinn, on behalf of the Trustees and the Faculty, presented Mr. H. A. Rowland, Professor of Physics, and the degree of Doctor of Philosophy, *honoris causa*, was conferred upon him for his attainments in Physics, and especially for the learning and ability evinced in his recent study of the problem of the Mechanical Equivalent of Heat.

An original ode was also read by Mr. Sidney Lanier, and a brief congratulatory address was delivered by Hon. William M. Evarts, LL. D., Secretary of State. A social assembly, which was attended by several hundred ladies and gentlemen, concluded the exercises.

At the close of the academic year, June 9, 1880, degrees were conferred upon another company of young men who had then completed their examinations. The complete list of graduates for the year is as follows:

DOCTORS OF PHILOSOPHY.

1. FRANCIS GREENLEAF ALLINSON, of New Jersey, who was graduated in Haverford College in 1876, in Harvard University in 1877, and received his degree as Master of Arts at Haverford College in 1879. He has been for three years a student and Fellow of this University, and has passed examinations in Greek, in Latin, and in Sanskrit. He presented a thesis, "On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus."

2. FABIAN FRANKLIN, of Baltimore, a graduate in 1869, of Columbian University, Washington, where he received the degree of Ph. B. He has been successively a Graduate Student, a Fellow and a Teacher in this University since 1876. His studies were in Mathematics and Physics. His thesis on "Bipunctual Co-ordinates" has been printed in the *American Journal of Mathematics*.

3. EDWIN HERBERT HALL, of Maine, who received his first degree in Bowdoin College in 1875, and has been a student in this University for three years. He has held the position of Fellow in Physics for two years. He has passed examinations in Physics and in Chemistry. His thesis, entitled "On the New Action of Magnetism on a Permanent Electric Current," is printed in the *American Journal of Science.*

4. ALLAN MARQUAND, of New York City, who was graduated in Princeton College in 1874, and has been a Fellow in this University for two years. He has passed examinations in Logic and in the History of Ethics. His thesis upon "The Logic of the Epicureans," with a translation of a treatise of Philodemus—*περὶ σημείων καὶ σημειώσεων*, is to be printed.

5. WASHINGTON IRVING STRINGHAM, of Kansas, who was graduated in Harvard University in 1877. He came to this University three years ago, and has been a Fellow for two years. He has passed examinations in Quaternions, Determinants, Elliptic Functions and other branches of Mathematics and in Logic. His thesis, "On Regular Figures in n-Dimensional Space," is printed in the *American Journal of Mathematics.*

BACHELORS OF ARTS.

1. THOMAS MILTON BEADENKOPF, of Baltimore, who was graduated at the City College in 1871, and has finished major courses in Greek and Latin, and minor courses in Physics, History and German.

2. ALLEN KERR BOND, of Harford County, Maryland, who received his previous training at Mr. G. G. Carey's School, Baltimore, and has here pursued major courses in Biology and Chemistry, and minor courses in German, Latin and Physics.

3. WILLIAM CATHCART DAY, of Baltimore, a former student at the City College, who has followed major courses in Chemistry and German, and minor courses in French, Mathematics and Physics.

4. HENRY LAURENCE GANTT, of Owings Mills, Maryland, who received his previous training in the McDonogh School, and has finished major courses in Mathematics and Physics, and minor courses in French, German and Philosophy.

5. EDGAR GOODMAN, of Baltimore, who graduated at the City College in 1875, and has finished major courses in Latin and History, and minor courses in German, French and Physics.

6. CARL ECKHARDT GRAMMER, of Baltimore, a former student of the City College, who has here pursued major courses in Greek and Latin, and minor courses in History, German and Chemistry.

7. ALEXANDER FRIDGE JAMIESON, of Virginia, who was graduated at the Phillips Academy, Exeter, in 1875, and has completed major courses in Greek and Latin, and minor courses in German, History and Physics.

8. EDMUND ALLEN JARVIS, of Baltimore, who received his previous training at Mr. G. G. Carey's School, Baltimore, and has followed major

courses in Chemistry and Biology, and minor courses in Latin, Greek and German.

9. STEWART BRIAN LINTHICUM, of Baltimore, a former student of Mr. G. G. Carey's School, who has finished major courses in Latin and German, and minor courses in Chemistry, French and History.

10. JOHN HANSON LOWE, of Baltimore, a former student of the City College, who has pursued major courses in Latin and History, and minor courses in German, French and Physics.

11. LEIGH CLINTON MORGAN, of Baltimore, who graduated at the City College in 1875, and has pursued major courses in Greek and Latin, and minor courses in Philosophy, German and Physics.

12. NELSON PALMER, of Baltimore, who received his previous training at Mr. G. G. Carey's School, and has here pursued major courses in Latin and German, and minor courses in History, French and Chemistry.

13. THOMAS PETTIGREW, of North Carolina, a former student at the Hillsboro' (N. C.) Military Academy, who has finished major courses in German and Latin, and minor courses in Physics, French and Mathematics.

14. HARRY FIELDING REID, of Baltimore, who graduated at the Pennsylvania Military Academy in 1876, and has followed major courses in Mathematics and Chemistry, and minor courses in Physics, German and Latin.

15. WILTZ RAYMOND STRICKLEN, of Baltimore, who graduated at the City College in 1876, and has completed major courses in Greek and Latin, and minor courses in German, Physics and History.

16. LEWIS WEBB WILHELM, of Baltimore, who graduated at the City College in 1871, and has taken major courses in German and Mathematics, and minor courses in Physics, French and History.

Degrees were conferred upon four of those above named on the Commemoration Day, February 23, 1880, and upon the others, June 9, 1880.

THE LIBRARY.

The University library continues to make a steady advance and now numbers nearly 9000 bound volumes of which 1363 have been added within a year. The collection of encyclopædias, dictionaries, gazetteers, and other books of reference is very complete, and the great writers of the world are well represented in the best modern editions. This was the nucleus of the library. Of

late, by the liberality of the Trustees, the special wants of different departments of instruction and research have been studied, and to some extent supplied. In classical and modern philology, large purchases have been made and the sciences of biology, physics, etc., have not been neglected. The Chemical Laboratory was opened with a full series of chemical journals which have been kept up without interruption. On the tables of the reading room may be found the most important periodicals of Europe and America. The number received is 256. Occasionally, we have asked for the loan of books from libraries at a distance, and the requests have been granted with a readiness which shows how widely the Librarians of the country accept the doctrine that "a book is never so valuable as when it is in use."

Scholarships.

Somewhat more than a year ago, the need of a system of graduate scholarships was so apparent to the President and Professors that they contributed the sum of $500, as the beginning of such a foundation. One of the Fellows generously gave for a like purpose the sum of $250, to which one of the Trustees added the sum of $100. Recently the Board has appropriated for the same object the sum of $2500 to be

bestowed during the coming year in ten scholarships. This may be regarded as a most valuable supplement to the system of Fellowships.

INTERNAL ADMINISTRATION.

Much attention has been bestowed during the year upon the question of the best method of governing a college. It seems to be conceded that the traditional Faculty meeting of American colleges is not exactly adapted to our circumstances, —and also that there is need of some organization by which the voice of the teaching body may be expressed on matters pertaining to instruction, discipline, examinations, and the selection of new instructors. I do not feel sure as to how this problem will be solved, but there is an obvious tendency to leave different departments of work to committees who are personally interested therein; thus we have a committee on the Library, and another on the making of instruments; and the instructors in kindred departments are in the habit of frequent conference with one another, without being organized under the name of committees. But the chief responsibilty has devolved upon the President and Professors. After some discussion last winter the Trustees, whose advice was sought, decided to adhere for the present to the usages which have been followed since the beginning and

to consider the President and Professors, under the name of the Academic Council, responsible for the interior conduct of the University until some further action is taken.

Conclusion.

In conclusion allow me to say a few words in respect to the relations of the University to Baltimore. The scholars, as well as the instructors, many of whom have come here from a distance, have been made at home in literary and social organizations, as well as in private households, with the hospitality for which Maryland is noted. The teachers of the city and many of the leading professional men have taken pains to become acquainted with our plans and to show their interest by intelligent comments and suggestions, and by helpful criticisms. Personal favors have been frequently accorded to us by the heads of large establishments, and by public functionaries. The newspapers of the city have been quick to catch the spirit of the University and to call attention to what has been in progress within its walls. For all these indications of good will, I am sure that the present members of the University will always be grateful, remembering that the success of the foundation is largely due to the kind welcome it has received from the people of Baltimore.

On the other hand it has been the desire of the authorities, both in the Board of Trustees and in the Faculty, so to order the University that the citizens might constantly feel the benefits of its establishment,—not only in the facilities afforded for the education of young men, but in many indirect ways:—for example, such lectures as might interest the public have been opened without charge; special classes have been instituted for the purpose of helping on the studies of young professional men, in history and constitutional law, in physiology and the use of the microscope, and in biblical exegesis; like courses, for the benefit of teachers exclusively, have been organized in physiology and morphology, (with instruction in the use of the microscope), in English, mathematics and Latin; requests for addresses and lectures, before schools and seminaries, literary societies, and popular audiences, have been cheerfully complied with; and many industrial, scientific, literary and educational questions have been brought to us, personally and by letter, for discussion and solution. If it is fortunate that the Johns Hopkins University is planted in Baltimore, let us hope that Baltimore may be equally fortunate in the growth of its University.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

APPENDIX.

A.

Academic Staff, 1876-80.*

PRESIDENT.

		Appointed.
Daniel C. Gilman,		*December* 30, 1874.

PROFESSORS.

Basil L. Gildersleeve,	*Greek*,	1876.
J. J. Sylvester,	*Mathematics*,	1876.
Ira Remsen,	*Chemistry*,	1876.
Henry A. Rowland,	*Physics*,	1876.
H. Newell Martin,	*Biology*,	1876.
Charles D. Morris,	*Classics*,	1876.

ASSOCIATES.

John M. Cross,	*Greek*,	1876.
Philip R. Uhler,	*Natural History*,	1876.
Austin Scott,	*History*,	1876.
A. Marshall Elliott,	*Romance Philology*,	1876.
Thomas C. Murray,	*Shemitic*,	1876–1879.
Herman C. G. Brandt,	*German*,	1876.
William K. Brooks,	*Biology*,	1876.
Harmon N. Morse,	*Chemistry*,	1876.
Robert Ridgway,	*Natural History*,	1876–1877.
William E. Story,	*Mathematics*,	1876.
Arthur W. Tyler,	*Librarian*,	1876–1878.
Charles S. Hastings,	*Physics*,	1876.
Charles R. Lanman,	*Sanskrit*,	1877–1880.
Herbert B. Adams,	*History*,	1878.
Albert S. Cook,	*English*,	1879.
Minton Warren,	*Latin*,	1879.
William Hand Browne,	*Librarian*,	1879.
Henry Sewall,	*Biology*,	1880.

* The names in each group are arranged in the order of appointment.

LECTURERS.

		Years of Service.
SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*,	1877.
FRANCIS J. CHILD,	*Early English, etc.*,	1877–1878.
THOMAS M. COOLEY,	*Law*,	1877–1879.
JULIUS E. HILGARD,	*Geodetic Surveys*,	1877.
JAMES RUSSELL LOWELL,	*Romance Literature*,	1877.
JOHN W. MALLET,	*Technological Chemistry*,	1877–1878.
FRANCIS A. WALKER,	*Political Economy*,	1877–1878.
WILLIAM D. WHITNEY,	*Comparative Philology*,	1877.
WILLIAM F. ALLEN,	*History*,	1878.
WILLIAM JAMES,	*Psychology*,	1878.
GEORGE S. MORRIS,	*Philosophy*,	1878–
J. LEWIS DIMAN,	*History*,	1879.
H. VON HOLST,	*History*,	1879.
WILLIAM G. FARLOW,	*Botany*,	1879.
J. WILLARD GIBBS,	*Theoretical Mechanics*,	1879.
SIDNEY LANIER,	*English Literature*,	1879–1880.
CHARLES S. PEIRCE,	*Logic*,	1879–
JOHN TROWBRIDGE,	*Physics*,	1880.
J. LEWIS DIMAN,	*History*,	1881.
A. GRAHAM BELL,	*Phonology*,	1881.

ASSISTANTS.

		Appointed.
HENRY SEWALL,	*Biology*,	1876–1878.
SAMUEL F. CLARKE,	*Biology*,	1879.
FABIAN FRANKLIN,	*Mathematics*,	1879.
LYMAN B. HALL,	*Chemistry*,	1879–1880.
CHRISTIAN SIHLER,	*Biology*,	1879–1880.
HENRY C. ADAMS,	*Political Economy*,	1879.
THOMAS CRAIG,	*Mathematics*,	1879.
WILLIAM T. SEDGWICK,	*Biology*,	1880.
EDWIN H. HALL,	*Physics*,	1880.
GEORGE H. STOCKBRIDGE,	*Latin and German*,	1880.
PHILIPPE B. MARCOU,	*French*,	1880.

B.

Roll of Fellows.*

Where no location is stated, the Johns Hopkins University is to be understood.

1. Henry Carter Adams, Ph. D., Lecturing upon Political Economy at the Johns Hopkins University, 1879–81.

From Waterloo, Iowa; Denmark Academy, Iowa, 1870; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; Lecturer upon Political Economy, at Cornell University, 1879–80, at University of Michigan, 1880–81; (*Political Science*, 1876–79.)

History of Taxation in the United States, (Graduating Thesis, J. H. U., 1878), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789–1816. (Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen, 1879.)
Coöperation. (Am. Soc. Sc. Assoc., 1878.)
Historical Position of Socialism in the Development of Political Economy. (Penn Monthly, 1879.)

2. Herbert Baxter Adams, Ph. D., Associate in History at the Johns Hopkins University, and Lecturer on History at Smith College, Northampton, Mass.

From Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872–73; Student of History and Political Science at Heidelberg and Berlin, 1873–76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878–80; (*History*, 1876–78.)

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (Maryland Historical Society, 1877.)

3. William Keith Brooks, Ph. D., Associate in Biology.

From Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874–75; (*Biology*, 1876; *appointed Associate before entering on the Fellowship.*)

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (Proc. Amer. Assoc., 1874.)
Embryology of the Fresh-Water Mussel. (Proc. Amer. Assoc., 1875.)
Embryology of Salpa. (Proc. Boston Soc. Nat. Hist., 1875.)
The Affinity of the Mollusca and the Molluscoida. (Proc. Boston Soc. Nat. Hist., 1875.)
The Development of Salpa. (Bull., Mus. Comp. Zoöl., Cambridge, No. 14.)
A Remarkable Life-History. (Am. Nat., Nov., 1876.)
A Provisional Hypothesis of Pangenesis. (Am. Nat., March, 1877.)
Parthenogenesis in Vertebrates and Molluscs. (Am. Nat., Oct., 1877.)
Preliminary Observations upon the Development of the Marine Prosobranchiate Gasteropods. (Studies from the Biol. Lab., J. H. U., 1879.)
The Development of Lingula and the Systematic Position of the Branchiopods. (Scientific Results, Chesapeake Zoöl. Lab., 1879.)
The Larval Stages of Squilla empusa. (Scientific Results, Chesapeake Zoöl. Lab., 1879.)
Embryology of the Fresh-Water Pulmonates. (Studies from the Biol. Lab., J. H. U., 1879.)
Abstract of Observations on the Development of the American Oyster. (Zoöl. Anzeiger, 1880.)
The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (Am. Jour. of Science, 1880.)
The Development of the American Oyster. (Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U., 1880.)
The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (Studies from the Biol. Lab., J. H. U., 1880.)
The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (Am. Jour. of Science, 1880.)
The Rhythmical Character of Segmentation. (Am. Jour. of Science, 1880.)
Budding in Free Medusae. (Am. Nat., 1880.)
Embryology and Metamorphosis of Lucifer. (Zoöl. Anzeiger, 1880.)
The Early Stages of the Squid. (Mem. Boston Soc. Nat. Hist., 1880.)

*See statement of System of Fellowships on page 51.

4. THOMAS CRAIG, Ph. D., Tidal Division, U. S. Coast and Geodetic Survey, Washington, D. C.; Lecturing on Mathematics at the Johns Hopkins University, 1879–81.

From Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878; (*Mathematics*, 1876–78; *Physics*, 1878–79.)

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (Graduating Thesis, J. H. U., 1878.)
Motion of a Point upon the Surface of an Ellipsoid. (Am. Jour. of Math., 1878.)
Mathematical Theory of Fluid Motion. (Van Nostrand's Eng. Mag., 1879.)
Wave and Vortex Motion. (N. Y., Van Nostrand, 1879.)
Motion of a Solid in a Fluid. (N. Y., Van Nostrand, 1879.)
Motion of a Solid in a Fluid. (Am. Jour. of Math., 1879.)
General Differential Equation for Developable Surfaces. (Jour. of Franklin Inst., 1879.)
Treatise on the Mathematical Theory of Projections. (U. S. Coast Survey, 1879.)
Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (Am. Jour. of Math., 1879.)
Motion of an Ellipsoid in a Fluid. (Am. Jour. of Math., 1879.)
Motion of Viscous Fluids. (Jour. of Franklin Inst., 1880.)
Steady Motion in Viscous Fluids. (Philos. Mag., 1880.)
Orthomorphic Projection of the Ellipsoid upon a Sphere. (Am. Jour. of Math., 1880.)

5. JOSHUA WALKER GORE, Professor of Natural Science, Southwestern Baptist University, Jackson, Tenn.

From Frederick County, Va.; C. E., University of Virginia, 1875; (*Mathematics*, 1876–78.)

6. GEORGE BRUCE HALSTED, Ph. D., Tutor in Mathematics at Princeton College.

From New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875–76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; (*Mathematics*, 1876–78.)

Basis for a Dual Logic. (Graduating Thesis, J. H. U., 1879.)
Spencer's Classification of the Abstract Sciences. (Popul. Sc. Mon., 1877.)
The New Ideas about Space. (Popul. Sc. Mon., 1877.)
Bibliography of Hyper-Space and Non-Euclidean Geometry. (Am. Jour. of Math., 1878–79.)
Note on the First English Euclid. (Am. Jour. of Math., 1879.)
Historical Sketch of Exact Rectilinear Motion. (Van Nostrand's Eng. Mag., 1878.)
Mechanical Conversion of Motion. (Van Nostrand's Eng. Mag., 1878; reprinted in "World of Science," *London.*)
Jevons's Criticism of Boole's Logic. (Mind, 1878.)
Boole's Logical Method. (Jour. of Spec. Philos., 1878.)
Statement and Reduction of Syllogism. (Jour. of Spec. Philos., 1878.)
Algorithmic Division in Logic. (Jour. of Spec. Philos., 1879.)
Modern Mathematicians as Educators. (Nassau Lit. Mag., XXXII, 2.)
Is Formal Logic a Branch of Mathematics. (Nassau Lit. Mag., XXXII, 3.)
Algebras, Spaces, Logics. (Popul. Sc. Mon., 1880.)
Metrical Geometry: A Treatise on Mensuration. (1880.)

7. EDWARD HART, Ph. D., Assistant Professor of Chemistry at Lafayette College.

From Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; (*Chemistry*, 1876–78.)

Nitrosulphobenzoic Acids and their Derivatives. (Graduating Thesis, J. H. U., 1879; Am. Chem. Jour., 1879.)
Volumetric Estimation of Sulphuric Acid. (Am. Chemist, VI, 284.)
Volumetric Estimation of Iron. (Chem. News, XXXIV, 65.)
Ueber Isomere Sulfosaüren aus Paranitrotoluene. (Ber. d. deut. chem. Ges., X, 1046
Notes from Chem. Lab., J. H. U., 1877.)
Handbook of Volumetric Analysis. (N. Y., Wiley, 1878.)
Stopcock of Easy Construction. (Am. Chemist, 1879.)

8. DANIEL WEBSTER HERING, Professor of Mathematics at Western Maryland College, Westminster.

From Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873-74; C. E., Yale, 1878; Assistant Engineer, Baltimore and Cumberland Valley Railroad, 1878-80; (*Engineering*, 1876-78.)

9. MALVERN WELLS ILES, Ph. D., Chemist, Leadville, Colorado.

From Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1877; (*Chemistry*, 1876-78.)

A New Qualitative Reaction for Boracic Acid. (Am. Chemist, 1876.)
On the Action of Ozone upon Milk. (Sc. Amer., 1877.)
On the Oxidation of Sulpho-Acids derived from Metaxylene. (Notes from Chem. Lab., J. H. U., 1877.)
On the Oxidation of Xylenesulphonic Acids. (With Prof. Remsen; Notes from Chem. Lab., J. H. U., 1877-78, Am. Chem. Jour., 1879.)
A New Method for the Quantitative Estimation of Sulphur. (Notes from Chem. Lab., J. H. U., 1878.)

10. WILLIAM WHITE JACQUES, Ph. D., Electrician of the American Bell Telephone Co., Boston, Mass.

From Newburyport, Mass.; S. B., Mass. Institute of Technology, 1876; Ph. D., Johns Hopkins, 1879; (*Physics*, 1876-79.)

Light Transmitted by One or More Plates of Glass. (Proc., Am. Acad., 1875.)
Answer to M. Jamin's Objections to Ampère's Theory. (Proc., Am. Acad., 1875.)
Diffraction of Sound. (Proc., Am. Acad., 1876.)
An Experimental Proof of the Law of Inverse Squares for Sound. (Proc., Am. Acad., 1876.)
Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (Jour. of Franklin Inst., 1878.)
Velocity of Very Loud Sounds. (Am. Jour. of Science, 1879.)
Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (Am. Jour. of Science, 1879.)
Distribution of Heat in the Spectra of Various Sources of Radiation. (Graduating Thesis, J. H. U., 1879; Proc., Am. Acad., 1879.)

11. CHARLES ROCKWELL LANMAN, Ph. D., Professor of Sanskrit at Harvard University.

From Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873-74, Tübingen, 1874-75, Leipzig, 1875-76; Secretary and Curator of the American Philological Association, 1879-81; Associate in Sanskrit, 1877-80; (*Sanskrit*, 1876-77.)

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (Leipzig, 1873-75.)
Compendium of Sanskrit Paradigms. (1876.)
A Conjectural Emendation of Rig-Veda i. 30. 11. (Am. Or. Soc. Proc., 1877.)
On Tentative Linguistic Forms. (Am. Or. Soc. Proc., 1878.)
Noun-Inflection in the Veda. (Am. Or. Soc. Jour., Vol. X., pp. 325-615.)
On Catalectic Vedic Verses of Seven Syllables. (Am. Or. Soc. Proc., 1880.)
A Sanskrit Reader, with Dictionary and Notes. Part I. Text, (in press.)

12. DAVID MCGREGOR MEANS, New York City.

From Andover, Mass.; A. B., Yale, 1868; Professor of Political and Mental Science in Middlebury College, Vermont, 1877-80; (*Political Science*, 1876-77.)

Aristotle. (Bibliotheca Sacra, 1876-77.)
The Pardoning Power. (New Englander, 1875.)
The Trouble with the Caucus. (New Englander, 1875.)
Are all Criminals insane? (New Englander, 1876.)
Chinese Immigration and Political Economy. (New Englander, 1877.)
Nominalism. (Mind, 1879.)
Taxation of Mortgages. (New Englander, 1880.)
Data of Ethics. (Bibliotheca Sacra, 1880.)

13. HARMON NORTHROP MORSE, Ph. D., Associate in Chemistry.

From Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875-76; (*Chemistry*, 1876; *appointed an Associate before entering upon the Fellowship.*)

Benzoylamidophenols. (Ber. d. deut. chem. Ges., 1874.)
Ueber Einige Derivate des Ortho-und Paramidophenols. (Inaugural Dissertation, Göttingen, 1875.)
On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (Notes from Chem. Lab., J. H. U., 1877.)
On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (Notes from Chem. Lab., J. H. U., 1877.)
On the Determination of Barium as Chromate. (Am. Chem. Jour., 1880.)

14. WALTER HINES PAGE, Cary, N. C.

From Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875-76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878-79; (*Greek*, 1876-78.)

15. P. PORTER POINIER.

From Newark, N. J.; M. E., Stevens Inst. of Technology, 1874; (*Physics*, 1876; *died, without entering upon the Fellowship, June*, 11, 1876, *aged* 23 *years.*)

Formulæ for the Apparent Specific Heat of Saturated Vapors. (Jour. of Franklin Inst., 1875.)

16. ERASMUS DARWIN PRESTON, U. S. Coast and Geodetic Survey, now stationed in Baltimore.

From Spruce Grove, Pa.; B. C. E., Cornell, 1875; Assistant Engineer Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875-76; (*Engineering*, 1876-78.)

17. HENRY JOSEPH RICE, Professor of Natural Sciences at Michigan Military Academy, Orchard Lake, Michigan.

From Cazenovia, N. Y.; B. S., Cornell, 1876, and M. S., 1880; Student of Biology, University of France, Paris, 1878; Assistant U. S. Fish Commission, 1879; (*Biology*, 1876-78.)

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, Osmerus eperlanus, (Md. Fish Commission, 1878.)
Notes upon the *Development of the Shad, Alosa sapidissima.* (Md. *Fish Commission*, 1878.)
Observations upon the Habits, Structure and Development of Amphioxus lanceolatus. (Am. Nat., 1880; trans. in Journal de Micrographie, Paris, 1880.)

18. JOSIAH ROYCE, Ph. D., Assistant Professor of Literature at the University of California.

From Oakland, Cal.; A. B., University of California, 1875; Ph. D., Johns Hopkins, 1878; (*Philosophy*, 1876-78.)

Interdependence of the Principles of Human Knowledge. (Graduating Thesis, J. H. U., 1878.)
Schiller's Ethical Studies. (Jour. of Spec. Philos., 1878.)
Shelley and the Revolution. (Californian, 1880.)
Nature of Voluntary Progress. (Berkeley Quarterly, 1880.)

19. ERNEST GOTTLIEB SIHLER, Ph. D., Classical Instructor, New York City.

From Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classical Philology at Berlin and Leipsic, 1872–75; Ph. D., Johns Hopkins, 1878; (*Greek*, 1876–79.)

Plato's Use of Metaphor and Comparison. (Graduating Thesis, J. H. U., 1878.)
Herodotus, Æschylus and the Battle of Salamis. (Trans., Am. Philol. Assoc., 1877.)
The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (Proc., Am. Philol. Assoc., 1879.)
Character and Career of Tiberius. (Penn Monthly, 1880.)
Virgil and Plato. (Trans., Am. Philol. Assoc., 1880.)

20. FREDERICK BOYD VAN VORST, Attorney at Law, New York City.

From New York City; A. B., Princeton, 1875; Fellow in Metaphysics in Princeton College, 1875–76; (*Ethics and Metaphysics*, 1876–77.)

21. JOHN HENRY WHEELER, Ph. D., Tutor at Harvard University.

From Woburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow of Harvard University, 1877–80; Ph. D., Bonn, 1879; (*Philology*, 1876–77.)

De Alcestidis et Hippolyti Euripidearum Interpolationibus. (Inaugural Dissertation, Bonn, 1879.)

22. SAMUEL FESSENDEN CLARKE, Ph. D., Assistant in Biological Laboratory, 1879–80.

From Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874–75; Assistant in Zoölogy in Sheffield Scientific School, 1874–76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; (*Biology*, 1876–79.).

New and Rare Species of Hydroids from the New England Coast. (Conn. Acad., 1875.)
New Hydroids of the Pacific Coast, South of Vancouver Island. (Conn. Acad., 1876.)
Hydroids of Alaska. (Acad. Nat. Sc., Phila., 1876; Smithsonian Institution, 1876.)
Hydroids of the Gulf Stream and Gulf of Mexico. (Mus. Comp. Zoöl., Camb., Mass., 1879.)
Development of Amblystoma punctatum, Baird. (Biol. Lab., J. H. U., 1879.)
Development of a Double-headed Vertebrate. (Boston Soc. Nat. Hist., 1880.)

23. LYMAN BEECHER HALL, Ph. D., Professor of Chemistry and Physics at Haverford College, Montgomery County, Pa.

From New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Assistant in Chemical Laboratory, 1879–80; (*Chemistry*, 1877–79.)

Ueber Orthonitrosalicylsäure und einige Abkömmlinge derselben. (Inaugural Dissertation, Göttingen, 1875.)
On the Oxidation of Mesitylene-Sulphonic Acid. (Notes from Chem. Lab., J. H. U., 1877; Ber. d. deut. chem. Ges., X.)
On the Oxidation of Substitution Products of Mesitylene. (Notes from Chem. Lab., J. H. U., 1878.)
Ueber Oxidationsprodukte aus Cymosulfamid. (Ber. d. deut. chem. Ges., XII.)
On the Oxidation of Substitution Products of Aromatic Hydrocarbons. (With Professor Remsen; Am. Chem. Jour., 1880.)

24. ALEXANDER DUNCAN SAVAGE, Assistant Director of the Metropolitan Museum of Art in New York.

From Pass Christian, Miss.; B. Litt., University of Virginia, 1870; (*Greek*, 1876–79.)

The "Oath of Rhadamanthus." (Proc., Am. Philol. Assoc., 1878.)

25. FABIAN FRANKLIN, Ph. D., Assistant in Mathematics.

From Baltimore; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870–71; City Surveyor's Office, Baltimore, 1871–77; Graduate Student of Mathematics, 1876–77; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1877–79.)

Bipunctual Coördinates. (Graduating Thesis, J. H. U., 1880; Am. Jour. of Math., 1878.)
Notes on Partitions of Numbers, etc. (Am. Jour. of Math., 1878; 1879.)
On the Calculation of the Generating Functions and Groundforms for Binary Quantics. (Am. Jour. of Math., 1880.)

26. CHRISTIAN SIHLER, Physician, Cleveland, Ohio.

From Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; Assistant in Biological Laboratory, 1879-80; (*Biology*, 1877-79.)

On the so-called Heat-Dyspnœa. (Jour. of Physiol., 1879.)
Some Further Observations on Heat-Dyspnœa. (Jour. of Physiol., 1880.)

27. FRANCIS GREENLEAF ALLINSON, Ph. D., Assistant Professor of Greek and Latin at Haverford College.

From Burlington, N. J.; A. B., Haverford, 1876, and A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878; Ph. D., Johns Hopkins, 1880; (*Greek and Sanskrit*, 1877–80.)

On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus. (Graduating Thesis, J. H. U., 1880.)
Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Isocrates and Demosthenes. (Quaker Alumnus, Phila., 1878.)
A Proposed Redistribution of Parts in the Parodos of the Vespae of Aristophanes. (Am. Jour. of Philol., 1880.)

28. MAURICE BLOOMFIELD, Ph. D., Student of Philology at Leipzig, Germany.

From Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; Student of Philology at Vienna, 1879–80; (*Sanskrit and Greek*, 1878–79.)

Noun-Formation of Rig Veda. (Graduating Thesis, J. H. U., 1879.)
The Ablaut of Greek Roots which show Variation between E and O. (Am. Jour. of Philol., 1880.)

29. CONSTANTINE FAHLBERG, Ph. D., Chemist, Gray's Ferry Chemical Works, Philadelphia.

From Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874–75; Analytical and Consulting Chemist, New York City, 1875–76; Assistant in Dr. Halse's Technological Laboratory, London, 1876–77; Chemist of the Colonial Company, London and Demerara (South America), 1877–78; Graduate Student of Chemistry, 1878; (*Chemistry*, 1878-80.)

Determination of Calcium Monosulphide in Boneblack. (Zeitsch f. analyt. chem., 1871.)
On Oxyacetic Acid. (Dissertation, Leipsic, 1873; Kolbe's Jour., 1873.)
New Method for the Volumetric Estimation of Zinc. (Zeitsch. f. analyt. chem., 1875.)
Description of the Manufacture of Cane Sugar in Demerara. (Royal Gazette, 1877.)
Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (U. S. Patent Office, 1878.)
A New Method for the Quantitative Estimation of Sulphur. (Notes from Chem. Lab., J. H. U., 1878.)
On the Oxidation of Tolueneorthosulphamide. (With Prof. Remsen; Ber. d. deut. chem. Ges., 1878; Am. Chem. Jour., 1880.)
On the Liquid Toluenesulphochloride. (Am. Chem. Jour., 1879.)
Reply to Delachanal and Mermet. (Ber. d. deut. chem. Ges., 1879.)
On Toluenedisulphonic Acid and its Derivatives. (Am. Chem. Jour., 1880.)

30. Edwin Herbert Hall, Ph. D., Assistant in Physics.

From Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics, 1877-78; (*Physics*, 1878-80.)

On a New Action of the Magnet on Electric Currents. (Am. Jour. of Math., 1879.)
On Boltzmann's Method of Determining the Velocity of an Electric Current. (Am. Jour. of Science, 1880.)
On the New Action of Magnetism on a Permanent Electric Current. (Graduating Thesis, J. H. U., 1880; Am. Jour. of Science, 1880.)

31. Edward Coles Harding, Classical Instructor, New York City.

From Northumberland County, Va.; A. M., University of Virginia, 1876; Law Department, University of Virginia, 1876-77; Classical Instructor, Baltimore, 1877-78; Professor of Greek, University of Louisiana, 1879-80; (*Greek*, 1878-79.)

32. Isaac Ott, Physician, Easton, Pa.

From Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876-77; A. M., Lafayette, 1877; (*Biology*, 1878-79.)

Cocain, Veratria and Gelsemium. (Phila., 1874.)
Rapidity of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Katelectrotonus. (Jour. of Nervous and Mental Diseases.)
The Action of Medicine. (Phila., Lindsay, 1868.)
Sweat-Centres. The Action of Muscarin and Atropin on them. (Jour. of Physiol., 1878.)
Observations on the Spinal Cord. (Studies from the Biol. Lab., J. H. U., 1880; Jour. of Physiol., 1879.)
Contribution to Physiology and Pathology of Nervous System, I & II. (Phila., 1879-80.) Also a large number of minor contributions to Phila. Med. Times; Boston Med. Journal; Jour. of Nerv. and Ment. Diseases, etc.

33. Henry Sewall, Ph. D., Associate in Biology.

From Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, 1876-78; Ph. D., Johns Hopkins, 1879; Student of Biology, at Leipsic, 1879-80; (*Biology*, 1878-79.)

Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (Jour. of Physiol., 1878.)
On the Effect of Two Succeeding Stimuli upon Muscular Contraction. (Jour. of Physiol., 1879.)
On the Changes in Pepsin-forming Glands during Secretion. (With J. N. Langley; Jour. of Physiol., 1879.)
Zur Physiologie des Sehepithels, insbesondere der Fische. (With W. Kühne; Untersuch, a. d. Physiol. Inst. z. Heidelberg, 1880.)

34. Washington Irving Stringham, Ph. D., Parker Fellow of Harvard University, and Student of Philosophy in the University of Leipsic.

From Topeka, Kansas; A. B., Harvard, 1877; Graduate Student of Mathematics, 1877-78; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1878-80.)

Investigations in Quaternions. (Proc., Am. Acad., 1878.)
Some General Formulae for Integrals of Irrational Functions. (Am. Jour. of Math., 1879.)
The Quaternion Formulae for Quantification and for Barycentres. (Am. Jour. of Math., 1879.)
Regular Figures in n-Dimensional Space. (Graduating Thesis, J. H. U., 1880; Am. Jour. of Math., 1880.)

35. ABRAM VAN EPPS YOUNG, Resident Graduate.

From Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875-77; Graduate Student of Chemistry, 1877-78; (*Chemistry*, 1878-80.)

An Apparatus for Gas Analysis from Simple Laboratory Material. (Am. Chem. Jour., 1879.)

36. CHARLES ROBERT HEMPHILL, Professor of Ancient Languages at the Southwestern Presbyterian University, Clarksville, Tenn.

From Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874-78; A. M., Davidson, 1878; (*Greek*, 1878-79.)

37. ALLAN MARQUAND, Fellow by Courtesy.

From New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78; Ph. D., Johns Hopkins, 1880; (*Logic and Ethics*, 1878-80.)

The Logic of the Epicureans,—with a translation of a treatise of Philodemus—περὶ σημείων καὶ σημειώσεων. (Graduating Thesis, J. H. U., 1880.)

38. CHARLES AMBROSE VAN VELZER.

From Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876-77; (*Mathematics*, 1878-81.)

39. BROWN AYRES, Professor of Physics at the University of Louisiana, New Orleans.

From New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics, 1878-79; (*Physics*, 1879-80.)

The Gramme Machine. (Sc. Amer. Supp., 1876.)
The Telephone. (Jour. of Franklin Inst., 1878.)
New Arrangement for Telephone. (Sc. Amer. Supp., 1878.)
Two New Forms of Bell Telephone. (Jour. of Franklin Inst., 1878.)

40. LOUIS BEVIER.

From Marbletown, N. Y.; A. B., Rutgers, 1878; Graduate Student of Greek, 1878-79; (*Greek*, 1879-81.)

41. EDWARD MUSSEY HARTWELL.

From Littleton, Mass.; Public Latin School, Boston, Mass., 1869; A. B., Amherst, 1873, and A. M., 1876; Vice Principal of High School, Orange, N. J., 1873-74; Instructor in Public Latin School, Boston, 1874-77; Student in Miami Medical College, Cincinnati, Ohio, 1877-78; Graduate Student of Biology and Chemistry, 1878-79; (*Biology*, 1879-81.)

The Function of the Internal Intercostal Muscles. (With Prof. H. N. Martin; Jour. of Physiol., 1879.)
The Legal Status of Anatomical Science. (Jour. of Social Science, 1880, in press.)
American Anatomy Acts; six articles. (Boston Med. and Surg. Jour., 1880.)
The Earliest English and American Medical Acts. (Boston Med. and Surg. Jour., 1880.

42. JOHN ROBIN MCDANIEL IRBY, Ph. D.

From Lynchburg, Va.; Miller Scholar of University of Virginia, 1873-75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878; (*Mineralogy*, 1879-80.) *Died, March*, 25, 1880.

Eine kritische Untersuchung ueber die bei dem Kalkspath vorkommenden Skalenoeder. (Prize Essay of the University of Bonn, 1877, expanded and published under the title, On the Crystallography of Calcite, Bonn, 1878; Groth's Zeitschrift, Bd. III.)

43. MITSURU KUHARA.

From Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, 1878-79; S. B., University of Tokio, 1879; (*Chemistry*, 1879-81.)

On the Red Colouring Matter of the Lithospernum erythrorhizon. (Jour. of Chem. Soc., London, 1879.)
A Method of Estimating Bismuth Volumetrically. (Am. Chem. Jour., 1879.)

44. OSCAR HOWARD MITCHELL.

From Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875-78; Graduate Student of Mathematics, 1878-79; *Mathematics*, 1879-81.)

On Binomial Congruences: Comprising an Extension of Fermat's and Wilson's Theorems, and a Theorem of which Both are Special Cases. (Am. Jour. Math., in press.)

45. EDWARD LEAMINGTON NICHOLS, Ph. D., Physicist, Edison's Laboratory, Menlo Park, N. J.

From Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875-79; Ph. D., Göttingen, 1879; (*Physics*, 1879-80.)

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (Pogg. Annalen, 1878, N. F., Bd. 3.)
Ueber das von glühendem Platin ausgestrahlte Licht. (Inaugural Dissertation, Göttingen, 1879.)
On the Color of the Sky. (Philos. Mag., 1879.)
On the Character and Intensity of the Rays emitted by glowing Platinum. (Am. Jour. of Science, 1879.)
On the Measurement of High Temperatures. (Am. Jour. of Science, 1880.)
On the Co-efficient of Expansion of Gas Solutions. (With A. W. Wheeler; Am. Assoc., Boston, 1880; abstract in Science, 1880.)

46. WALDO SELDEN PRATT, Second Assistant Director of the Metropolitan Museum of Art, New York City.

From Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878; Graduate Student of Greek and Archæology, 1878-79; (*Aesthetics and the History of Art*, 1879-80.)

Two Essays on the Columnar Architecture of the Egyptians. (Proc. Am. Acad., 1880.)

47. WILLIAM THOMPSON SEDGWICK, Assistant in the Biological Laboratory.

From Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877-78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878-79; (*Biology*, 1879-80.)

The Influence of Quinine upon the Reflex-excitability of the Spinal Cord. (Jour. of Physiol., 1880.)

48. HERMAN VOORHEES.

From Troy, N. Y.; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry, 1878-79; (*Chemistry*, 1879; *died October* 14, 1879, *without entering on the Fellowship, aged* 27 *years.*)

49. CHARLES OTIS WHITMAN, Ph. D., Professor of Zoölogy at the University of Tokio, Japan.

From Newton Highlands, Mass.; A. B., Bowdoin, 1868, and A. M., 1871; Ph. D., Leipsic, 1878; (*Biology*, 1879; *did not enter upon the Fellowship.*)

The Embryology of Clepsine. (Quart. Micros. Jour., London, 1878.)

50. EDMUND BEECHER WILSON.

From Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877-79; (*Biology*, 1879-81.)

Description of Two New Genera of Pycnogonida. (Am. Jour. of Science, 1878.)
The Pycnogonida of New England and Adjacent Waters. (U. S. Fish Comm. Report, 1877.)
A Synopsis of the Pycnogonida of New England. (Conn. Acad., 1878.)
Preliminary Abstract of Observations on the Early Stages of some Polychaetous Annelides. (Zoölog. Anzeiger, 1880.)
Notes on the Early Stages of some Polychaetous Annelides. (*Am. Jour. of Science*, 1880.)
The Metamorphosis of Actinotrocha. (Am. Assoc., 1880; abstract in Am. Nat., 1880.)
The Early Stages of Renilla. (Am. Jour. of Science, 1880.)

51. GEORGE FREDERICK NICOLASSEN.

From Baltimore; A. B., University of Virginia, 1879, and A. M., 1880; (*Greek*, 1879-81.)

52. WILLIAM BURNEY, Ph. D., Professor of Chemistry at the South Carolina Agricultural College, Columbia.

From Davidson College, N. C.; S. B., Davidson, 1875; Student of Chemistry at Leipsic, Heidelberg, and Paris, 1875-79; Ph. D., Heidelberg, 1879; (*Chemistry*, 1879-80.)

On Erbium and Yttrium. (Jour. of Chem. Soc., London, 1879.)

53. ROBERT WOODWORTH PRENTISS.

From New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-81.)

54. JAMES WILSON BRIGHT.

From Lock Haven, Pa.; A. B., Lafayette, 1877, and A. M., 1880; Graduate Student of Teutonic Languages, 1879-80; (*Teutonic Languages*, 1880-81.)

55. BENJAMIN CHAPMAN BURT.

From Ann Arbor, Michigan; A. B., University of Michigan, 1875, and A. M., 1879; Professor of English Literature in Indiana State Normal School, 1875-78; Graduate Student of Philosophy, 1879-80; (*Philosophy*, 1880-81.)

56. SPENCER HEDDEN FREEMAN.

From Mumford, N. Y; A. B., Rochester, 1875, and A. M., 1878; Teacher of Physical Science, Le Roy Academy, N. Y., 1875-76; Instructor in Mathematics and Physics, Denison University, 1876-78; Graduate Student of Physics and Mathematics, 1879-80; (*Physics*, 1880-81.)

57. KAKICHI MITSUKURI.

From Tokio, Japan; Ph. B., Yale, 1879; Graduate Student of Biology, 1879-80; (*Biology*, 1880-81.)

58. Bernard Francis O'Connor.

From Paris, France; Bach. ès lettres, Université de France, 1874; Graduate Student of Romance Languages, 1879-80; (*Romance Languages*, 1880-81.)

French verbs in eler and eter. (Am. Jour. of Philol., 1880.)

59. Chase Palmer.

From Baltimore; Matriculated Student, 1876-79, A. B., 1879, and Graduate Student, 1879-80; (*Chemistry*, 1880-81.)

60. Herbert Mills Perry.

From New Ipswich, N. H.; Appleton Academy, N. H., 1868-71; Phillips Academy, Exeter, N. H., 1876; A. B., Harvard, 1880; (*Mathematics*, 1880-81.)

61. William Lee Rowland.

From Springfield, Mass.; Springfield High School; Massachusetts Inst. of Technology; S. B., University of Pennsylvania, 1878, and Assistant in Chemistry, 1878-80; (*Chemistry*, 1880; *did not enter upon the Fellowship.*)

62. Edward Henry Spieker.

From Baltimore; Matriculated Student, 1877-79, A. B., 1879, and Graduate Student, 1879-80; (*Greek*, 1880-81.)

63. Morrison Isaac Swift.

From Ashtabula, Ohio; Grand River Institute, Ohio, 1874-75; Western Reserve College, 1875-77; Williams College, 1877-79, and A. B., 1879; Graduate Student of Greek and Philosophy, 1879-80; (*Philosophy*, 1880-81.)

64. Arthur Wilson Wheeler.

From Rockland, Mass.; A. B., Amherst, 1879; Graduate Student of Physics, 1880; (*Physics*, 1880-81.)

On the Co-efficient of Expansion of Gas Solutions. (With E. L. Nichols; Am. Assoc., Boston, 1880; abstract in Science, 1880.)

65. Robert Dorsey Coale.

From Baltimore; C. E., Pennsylvania Military Academy, 1875; Special Student of Chemistry, 1876-80; (*Chemistry*, 1880-81.)

On Anhydrosulphamineisophthalic Acid. (With Prof. Remsen; Ber. d. deut. chem. Ges., 1879.)

66. Andreas Franz Wilhelm Schimper.

From Strassburg, Germany; Gymnasium at Strassburg, 1864-1874; Ph. D., Strassburg, 1878; Assistant and Provisional Director in the Museum of Natural History, Strassburg, 1878-80; (*Biology*, 1880-81.)

Blödit und Glauberit von Vurcha in Pendschab. (Zeitsch. für Krystallographie, 1877.)
Untersuchungen über die Proteinkrystalloide der Pflanzen. (Inaugural Dissertation; Strassburg, 1878.
Kupferkies in *Groth*, "Die Mineraliensammlung der Universität Strassburg." (Strassburg, 1879.)
Die Vegetationsorgane von Prosopanche Burmeisteri. (Abhandl. der naturfors. Ges. zu Halle, 1880.)
Die Krystallisation der eiweissartigen Substanzen. (Zeitsch. für Krystallographie, 1880; in press.)
Untersuchungen über die Entstehung der Stärkekörner. (Botanische Zeitung, 1880; in press.)

C.

Graduates.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS, (*A. B., Iowa, 1874*).
THOMAS CRAIG, (*C. E., Lafayette, 1875*).
JOSIAH ROYCE, (*A. B., University of California, 1875*).
ERNEST GOTTLIEB SIHLER, (*Concordia, 1869*).

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD, (*A. M., Furman, 1877*).
SAMUEL FESSENDEN CLARKE, (*Ph. B., Yale, 1873*).
GEORGE BRUCE HALSTED, (*A. B., Princeton, 1875*).
EDWARD HART, (*S. B., Lafayette, 1874*).
WILLIAM WHITE JACQUES, (*S. B., Mass. Inst. of Techn., 1876*).
HENRY SEWALL, (*S. B., Wesleyan*, 1876).

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY,
CHASE PALMER,
EDWARD HENRY SPIEKER.

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON, (*A.B., Haverf., 1876; A.B., Harv. 1877*).
FABIAN FRANKLIN, (*Ph. B., Columbian, 1869*).
EDWIN HERBERT HALL, (*A. B., Bowdoin, 1875*).
ALLAN MARQUAND, (*A. B., Princeton, 1874*).
WASHINGTON IRVING STRINGHAM, (*A. B., Harvard, 1877*).

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF,
ALLEN KERR BOND,
WILLIAM CATHCART DAY,
HENRY LAURENCE GANTT,
EDGAR GOODMAN,
CARL ECKHARDT GRAMMER,
ALEXANDER FRIDGE JAMIESON,
EDMUND ALLEN JARVIS,
STEWART BRIAN LINTHICUM,
JOHN HANSON LOWE,
LEIGH CLINTON MORGAN,
NELSON PALMER,
THOMAS PETTIGREW,
HARRY FIELDING REID,
WILTZ RAYMOND STRICKLEN,
LEWIS WEBB WILHELM.

D.

Enumeration of Classes which have been instructed during the Academic Year, 1879-80.

The following lists show the principal classes which have been organized and instructed during the year:

Mathematics. (31 Students.)

THEORY OF NUMBERS (8). *Twice weekly, through the year: Prof. Sylvester.*

MATHEMATICAL SEMINARY (15). *Once monthly, through the year: Prof. Sylvester and Dr. Story.*

QUATERNIONS (4). *Thrice weekly, through the year: Dr. Story.*

ELLIPTIC FUNCTIONS (4). *Thrice weekly, through the year: Dr. Story.*

HIGHER PLANE CURVES (5). *Four times weekly, first half year: Dr. Story.*

SOLID ANALYTIC GEOMETRY (4). *Four times weekly, second half year: Dr. Story, assisted by the Fellows in Mathematics.*

DIFFERENTIAL EQUATIONS (8). *Thrice weekly, through the year: Dr. Story.*

CALCULUS OF VARIATIONS (9). *Twelve Lectures: Dr. Craig.*

SPHERICAL HARMONICS (6). *Twenty Lectures: Dr. Craig.*

CYLINDRIC OR BESSEL'S FUNCTIONS (2). *Ten Lectures: Dr. Craig.*

GENERAL THEORY OF FUNCTIONS (2). *Thirty Lectures: Dr. Craig.*

DIFFERENTIAL AND INTEGRAL CALCULUS (9). *Thrice weekly, through the year: Dr. Franklin.*

CONIC SECTIONS (3). *Thrice weekly, through the year: Dr. Franklin: —Instruction given chiefly by lectures from notes prepared by Dr. Story.*

THEORY OF EQUATIONS (6). *Twice weekly, through the year: Dr. Franklin.*

The results of special studies upon the following subjects, among others, have been examined and discussed in the Mathematical Seminary, under the direction of Prof. Sylvester and Dr. Story:

A generalized form of analytical triangle; on vector ratios considered as trigonometric functions of angles; on the condition that a linear total differential equation of the first order in any number of variables may admit of a single primitive; a generalization, for n-fold space, of Euler's equation for polyhedra; a completion of Fermat's theorem; on generalized forms of trigonometric ratios; on volumes and surfaces of n-dimensional spheres; on triangles in- and ex-scribable to a general cubic curve; on binomial congruences; rotation in four-dimensional space; a general method of congruences, and its application to the theory of cyclotomic functions; completion of Wilson's theorem, and on the number of nth residues. Abstracts of these papers have been printed in the University Circulars.

Physics. (38 Students.)

GENERAL PHYSICS [Elementary Mechanics, Acoustics and Heat, first half year; Magnetism, Electricity and Light, second half year] (15). *Daily lectures and exercises, through the year: Dr. Hastings.*

THERMODYNAMICS (6). *Thirty lectures and eight conferences: Prof. Rowland.*

ELECTRICITY AND MAGNETISM (3). *Twenty lectures and five conferences: Prof. Rowland.*

THEORY OF HEAT CONDUCTION (5). *Three lectures and one conference, weekly, second half year: Prof. Rowland.*

RATIONAL MECHANICS (10). *Four times weekly, January and February: Prof. Gibbs, of Yale College.*

LABORATORY WORK FOR ADVANCED SPECIAL STUDENTS (10). *Daily, through the year: Prof. Rowland.*

PHYSICAL SEMINARY (17). *Saturdays, through the year: Dr. Hastings.*

READING AND DISCUSSION OF CURRENT PHYSICAL JOURNALS (9). *Once weekly, through the year.*

PHILOSOPHY OF PHYSICS. *Twelve public lectures: Prof. Trowbridge, of Harvard University.*

The researches carried on in the Physical Laboratory, by the Fellows and advanced students under the direction of Prof. Rowland, included the following subjects:

The comparison of the electrical resistance with the expansion of a platinum wire at all temperatures up to a white heat; the electric absorption of crystals; the new action of magnetism on an electric current; the determination of the mechanical equivalent of heat by electrical means, using the coil whose absolute resistance was determined here some years ago; the effect of dissolved gases on the expansion of water; the action of magnetism on light; etc.

The work of the Physical Seminary has included: (a)—solution of problems and criticism of results (once weekly, through the year); (b)—five lectures on the laws of probability as applied to the discussion of observations, with examples; (c)—for advanced students, weekly lectures on selected problems in applied mathematics; (d)—problems of various orders of difficulty which have been assigned and full reports demanded. A series as complete as possible was framed for those who were striving to meet the requirements of a major course. Other students have given special attention to a particular field—for example, one of the Fellows has devoted his attention largely to electricity and magnetism; another to light (and in one of his reports he has given a new and brief solution of the problem of minimum deviation in the prism, which will be published in the American Journal of Mathematics). One of the special students, by a careful investigation, has determined the equations of the standard meter belonging to the University, thus rendering it useful for the most exact work.

Chemistry. (46 Students.)

GENERAL CHEMISTRY (21). *Four lectures by Prof. Remsen, and two examinations by Dr. Morse, weekly, first half year.*

GENERAL CHEMISTRY (continued) (9). *Four lectures and two examinations weekly, second half year: Dr. Morse.*

ORGANIC CHEMISTRY (20). *Four lectures weekly, second half year: Prof. Remsen.*

ANALYTICAL CHEMISTRY (15). *Three times weekly, first half year: Dr. Morse.*

LABORATORY WORK (35). *Four to eight hours daily, through the year: Prof. Remsen and Dr. Morse, and Dr. L. B. Hall.*

READING AND DISCUSSION OF CURRENT CHEMICAL JOURNALS (9). *Twice weekly, through the year.*

The Fellows and advanced students have also been engaged daily in the laboratory in following out various investigations, mostly under the direction of Prof. Remsen. The principal of these are: On the comparison of sulphonic acids from different sources; sulphoterephthalic acid; sulphoisophthalic acid; the oxidation of nitroxylene; the oxidation of substitution-products of paradiethylbenzene; toluenedisulphonic acid and its derivatives; the oxidation of substitution-products of mesitylene; and the conduct of some unsaturated compounds.

Biology. (32 Students.)

ANIMAL PHYSIOLOGY (11). *Twice weekly, through the year: Prof. Martin.*

GENERAL BIOLOGY (13). *Four times weekly, through the year: Prof. Martin.*

ANIMAL MORPHOLOGY (4). *Four times weekly, first half year: Dr. Brooks.*

OSTEOLOGY, HUMAN AND COMPARATIVE (11). *Twice weekly, through the year: Dr. Brooks.*

HISTOLOGY (11). *Special course in laboratory: Dr. Sihler.*

SPECIAL RESEARCHES IN LABORATORY (8). *Through the year: Prof. Martin and Dr. Brooks.*

LABORATORY INSTRUCTION, in connection with the lecture courses (23). *Through the year: Prof. Martin, Drs. Brooks, Sihler and Clarke.*

STRUCTURE, ETC., OF THE CRAB AND THE OYSTER. *Three public lectures: Dr. Brooks.*

DEMONSTRATIONS IN PHYSIOLOGY TO MEDICAL STUDENTS (16). *Eighteen lectures with experiments: Prof. Martin.*

PRACTICAL INSTRUCTION IN HISTOLOGY TO MEDICAL STUDENTS (4). *Eighteen lectures, with laboratory work: Dr. Sihler.*

During the year investigations have been carried on in the laboratory on the following subjects, and articles based on them have either been already published or will shortly be:—Influence of stimulation of anterior

spinal roots on reflex excitability of the spinal cord; on heat dyspnœa; the influence of quinine on the heart and spinal cord; the nature of the inflammatory changes in Keratitis; does a transference of solid particles from maternal to fœtal blood take place?; the structure and significance of the gills of Yoldia, Cyclas and Modiola; the development of Amblystoma punctatum (continued); the embryology of the earth-worm.

During the summer of 1880, the Chesapeake Zoölogical Laboratory for the study of forms of marine life was conducted by Dr. Brooks at Beaufort, N. C. A class for beginners was also taught at Fort Wool by Dr. Clarke.

Greek. (36 Students.)

PINDAR (7). *Twice weekly, through the year: Prof. Gildersleeve.*

GREEK LYRIC POETRY (8). *Once weekly, through the year: Prof. Gildersleeve.*

GREEK SEMINARY (11). *Twice weekly, through the year: Prof. Gildersleeve.*

GREEK COMPOSITION AND TRANSLATION (13). *Twice weekly, for three months: Prof. Gildersleeve.*

AESCHYLUS, SOPHOCLES AND EURIPIDES (9). *Six readings: Prof. Gildersleeve.*

SYNTAX OF GREEK COMPOUND SENTENCE (9). *Second half year: Prof. Gildersleeve.*

GREEK TRAGIC POETS. *Nine public lectures: Prof. Gildersleeve.*

ARISTOTLE, Rhetoric (12). *Thrice weekly, first half-year: Prof. C. D. Morris.*

PLATO, Georgias, Meno (8). *Four times weekly, second half-year: Prof. C. D. Morris.*

HOMER, Odyssey (6). *Four times weekly, first half-year: Prof. C. D. Morris.*

LYSIAS, Orations, vii, xii, xvi, xxv; ISOCRATES, Orations, i, ix (6). *Four times weekly, second half year: Prof. C. D. Morris.*

GREEK PROSE COMPOSITION (13). *Once weekly, through the year: Prof. C. D. Morris.*

NEW TESTAMENT GREEK (8). *Thrice weekly, through the year: Mr. Cross.*

NEW TESTAMENT EXEGESIS (5). *Once weekly, through the year: Mr. Cross.*

EXEGESIS OF THE GOSPELS. *Fifteen lectures: Mr. Cross.*

Students have privately read for examination:

ARISTOPHANES, Frogs (2); Plutus (1); Knights (1).

THUCYDIDES, bk. iv (1); bks. i, iv (1); bk. i (1).

DEMOSTHENES, De Corona (1).

HERODOTUS, bks. v-ix (1); bk. v (1); bk. i (1).

EURIPIDES, Alcestis (1); Hippolytus (1); Ion, Bacchae (2).

HOMER, Odyssey, bks. i, vi (4); Iliad, bks. i-vi (2); Iliad, bks. vii-xii (2).

During the session of 1879–80, the centre of work in the Greek Seminary was Aristophanes, and the play selected for special study was the *Wasps*. The members of the seminary were required to present in turn an exegetical and critical commentary of a portion of this comedy, and this work constituted a regular weekly exercise. In order to secure a wider knowledge of the author, cursory readings were also instituted in the other plays, which were in like manner assigned to certain students, charged with the duty of preparing the historical introduction and the analysis. In this way nearly all the members of the seminary were made acquainted with the bulk of Aristophanes, and some of them followed besides a course of study in the fragments of the comic poets. Among the more elaborate papers, which were the fruit of this work in Aristophanes, may be mentioned the following: On the Tropology of Aristophanes; on the genitive case in Aristophanes; on the infinitive in Aristophanes; on the distribution of the *choreutai* in the *Wasps*.

Latin. (40 Students.) *Dr. Warren.*

PLAUTUS (13). *Once weekly, through the year.*

HISTORICAL LATIN GRAMMAR (15). *Twelve lectures.*

TERENCE, Hautontim., Adelphi; PLAUTUS, Aulularia (14). *Four times weekly, first half year.*

LUCRETIUS, bks. i, iii, v (10). *Four times weekly, second half year.*

HORACE (18), *Four times weekly, first half year.*

LIVY, bks. xxi, xxii (18). *Four times weekly, second half year.*

LATIN PROSE COMPOSITION (14). *Once weekly, through the year.*

Students have privately read for examination:

TERENCE, Eunuchus, Phormio, Andria, Hecyra, (2); Adelphi, Hautontim. (2); Hautontim. (1); Andria (1).

TACITUS, Germania, Agricola (2); Historiae, bks. i, ii (1), Historiae, bks. ii-v (2); Annals, bk. vi (1).

JUVENAL, Satires (2).

PLAUTUS, Mostellaria (1).

CICERO, Orator (2); de Officiis (1).

LIVY, bks. ii-vii (1).

VIRGIL, Aeneid, bks. i-xii (1); bks. i-vi (1).

HORACE, Odes, Epodes, Satires, Ars Poetica (1); Satires, Epistles (1); Epodes (1).

CÆSAR, Bell. Civ (1).

Sanskrit. (8 Students.) *Dr. Lanman.*

HYMNS OF THE RIG AND ATHARVA-VEDAS (1). *Twice weekly, through the year.*

ADVANCED SANSKRIT [Kathâ-sarit-sâgara, Proverbs, Veda] (2). *Twice weekly, through the year.*

ELEMENTARY SANSKRIT (5). *Twice weekly, through the year.*

THE VEDAS. *Six public lectures.*

German. (60 Students.) *Mr. Brandt.*

GOTHIC [Ulfila] (2). *Twice weekly, first half year.*

MIDDLE HIGH GERMAN [Nibelungenlied] (1). *Once weekly, second half year.*

MIDDLE HIGH GERMAN [Minnesinger; Hartmann, *Der arme Heinrich;* Lectures on Grammar and Middle High German Literature (8). *Twice weekly, second half year.*

GERMAN PROSE COMPOSITION [Essays; Lectures on Historical Grammar; Dictations from English into German] (17). *Once weekly, through the year.*

LECTURES ON GERMAN BALLADS (17). *Once weekly, October to April.*

GOETHE, Faust, part i (14). *Once weekly, April to June.*

LESSING, Nathan der Weise (14). *Once weekly, first half year.*

HUMBOLDT, Ansichten der Natur; SCHILLER'S AND LESSING'S Prosa (10). *Twice weekly, through the year.*

MINOR COURSE, Class *B*, First Division [Bluntschli, *Völkerrecht;* Goethe's and Lessing's *Prosa;* Goethe, *Egmont;* Bernstein, *über Humboldt;* Schiller's Minor Poems; Lectures on comparative study of English and German; Exercises, etc.] (18). *Five times weekly through the year.*

MINOR COURSE, Class B, Second Division [Schiller, *Neffe als Onkel;* Exercises; Grammar] (12). *Thrice weekly, first half year.*

MINOR COURSE [Hodges' *Scientific German*] (6). *Twice weekly, second half year.*

Students have read privately for examination:

SCHILLER, Wilhelm Tell (3); Neffe als Onkel (1).

LESSING, Minna v. Barnhelm (2); Laokoön (1).

GOETHE, Prosa (3).

HUMBOLDT, Ansichten der Natur (3).

SCIENTIFIC GERMAN (2).

GERMAN, Minor Poems (1).

English. (19 Students.) *Mr. Cook.*

OLD SAXON, [Heliand] (2). *Twice weekly, second half year.*

EARLY ENGLISH, Advanced Class (1). *Once weekly, second half year.*

ANGLO SAXON, Advanced Class (1). *Thrice weekly, first half year.*

ANGLO-SAXON, Elementary Class (11). *Twice weekly, second half year.*

CHAUCER [The Prioresses Tale, Sir Thopas, The Squieres Tale] (4). *Seven expository readings.*

ANGLO-SAXON LAWS (5). *Seven recitations.*

SHAKESPEARE, Class A (7). *Daily, first half year.*

SHAKESPEARE, Class B (6). *Twice weekly, first half year.*

ENGLISH VERSE, especially Shakespeare's. *Sixteen public lectures: Mr. Lanier.*

Romance Languages. (39 Students.)

ROMANCE DIALECTS (3). *Lectures once weekly, through the year: Mr. Elliott.*

PROVENÇAL [Girart de Rossilho; Marcabrun; Peire Vidal; Bertran de Born; Folquet de Marseille; Raimbaut de Vaqueiras; Guiraut de Borneil] (3). *Once weekly, through the year: Mr. Elliott.*

WALLACHIAN [Alecsandri (Vasile), *Hora de la Plevna; Hora de la Grivita, La Turnu-Măgurele;* extracts from the writings of Sionu, Alecsandrescu, Boliacu, Muresianu] (3). *Once weekly, through the year: Mr. Elliott.*

FRENCH, Advanced Course [Chanson de Roland; Lois de Guillaume le Conquérant; Alexandre d'Alberic de Besançon; Garin le Loherain; Amis et Amiles; Guillaume d'Orenge; Renaut de Montauban; Le Roman de Brut (Wace)] (3). *Once weekly, through the year: Mr. Elliott.*

FRENCH, Major Course [Lectures on the distribution of the Romance Languages; Villehardoin, *La Conqueste de Constantinople; Aucasin et Nicolete;* Adenet Le Roi, *Berte au grand pied;* Marie de France, *Lais. Fables*; Brachet, *Grammaire Historique*] (7). *Twice weekly, through the year: Mr. Elliott.*

FRENCH, Minor Course, Class A [De Musset, *Un Caprice;* Feuillet, *Roman d'un jeune homme pauvre;* Balzac, *Père Goriot;* Racine, *Plaideurs;* Voltaire, *Mérope;* Molière, *Tartufe;* Translating English into French; Grammars (in French) (Ploetz; Brachet), etc.] (14) *Daily, through the year: Mr. Elliott and Mr. Garner.*

FRENCH, Minor Course, Class B [Keetels' *Analytical French Reader, p't ii;* Scribe, *La Bataille de Dames;* De Maistre, *Voyage autour de ma chambre;* Töpffer, *Mésaventures d'un écolier;* Villemain, *Lascaris;* Fiévée, *La Dot de Suzette;* About, *Les Jumeaux de l'Hôtel Corneille;* Poetical Selections from Hugo, Lamartine, etc.; Exercises; Grammar; etc.] (11). *Daily, through the year: Mr. Elliott and Mr. Garner.*

SCIENTIFIC FRENCH, Saturday Class [Bréal, *Les Idées Latentes du Langage;* Hovelacque, *Notre Ancêtre*] (14). *Once weekly, second half year: Mr. Elliott and Mr. Garner.*

FRENCH, Conversation Class (7). *Thrice weekly, through the year: M. Rabillon.*

FRENCH EPIC POETRY, especially the Chanson de Roland. *Twelve public lectures in French: M. Rabillon.*

FRENCH LITERATURE. *Twelve public readings in French: M. Rabillon.*

History and Political Science. (33 Students.)

SEMINARY OF AMERICAN HISTORY (15). *Once weekly, two months: Dr. Scott.*

COMPARATIVE CONSTITUTIONAL HISTORY (5). *Once weekly, four months: Dr. H. B. Adams.*

HISTORY OF THE RENAISSANCE AND REFORMATION (17). *Daily, first half year, also ten public lectures: Dr. H. B. Adams.*

ENGLISH CONSTITUTIONAL HISTORY [Stubbs's *Select Charters*] (15). *Once weekly, six months: Dr. H. B. Adams.*

POLITICAL ECONOMY (13). *Four times weekly, two months: Dr. H. B. Adams.*

MONEY AND BANKING (12). *Four times weekly, two months: Dr. H. C. Adams.*

NATIONAL DEBTS. *Nine public lectures: Dr. H. C. Adams.*

Logic. (16 Students.) *Mr. Peirce.*

GENERAL COURSE, (14). *Thrice weekly, six months.*

MEDIAEVAL LOGIC (5). *Once weekly, three months.*

PROBABILITIES (4). *Once weekly, two months.*

MILL'S LOGIC (8). *Once weekly, three months; twice weekly, one month; Mr. Marquand.*

History of Philosophy and Ethics. (12 Students.) *Prof. G. S. Morris.*

HISTORY OF BRITISH PHILOSOPHY (12). *Three times weekly, second half year.*

GERMAN AESTHETICS (2). *Once weekly, second half year.*

BRITISH THOUGHT AND THINKERS. *Twelve public lectures.*

ETHICS (5). *Once weekly, second half year.*

Classes have also been instructed in Physiography, Drawing, Elocution, etc.

E.

System of Fellowships.

Twenty Fellowships, each yielding five hundred dollars, are annually open to competition in this University.

Object of the Foundation.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions, (though such persons have not been formally excluded from the competition,) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or determined to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions and answers submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The Professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and attractive posts in different parts of the country.

Note.—The number of applications for Fellowships has been very large, and it may have happened that some candidates have failed of

appointment who were really superior to those selected. But if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the University merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the Professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that Graduate Students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but, as the list below will show, the absence of a candidate from Baltimore has been no bar to his appointment, in cases where adequate evidence of his claims has been presented.

Summary.

At the opening of the University, 22 Fellows were appointed; of the 44 since appointed, 22 commenced their career here as Graduate Students.

Fellowships have been awarded in the following departments of study: Mathematics and Physics, 18, (including 2 in Engineering); Chemistry, 13, (including 1 in Mineralogy); Biology, 12; Languages, 14, (including 9 in Greek); History and Philosophy, 9.

Of the 46 who have left, 28 have gone forward to honorable positions as Instructors in Colleges and other institutions of a high character; 2 are attached to the United States Coast Survey, and 2 to the Metropolitan Museum of Art, New York; 4 are engaged in the application of science to practical work; 2 are Physicians, 1 is an Attorney at Law, and 4 are still pursuing their studies here or abroad.

Those appointed as Fellows had received the Baccalaureate degree at the following institutions:

Amherst College,	5	Mass. Inst. of Technology,	1
Bowdoin College,	2	Michigan, University of,	2
California, University of,	1	Pennsylvania, University of,	1
Columbia College,	1	Princeton College,	3
Columbian University,	1	Randolph-Macon College,	1
Cornell University,	4	Rensselaer Polytechnic Inst.,	1
Davidson College,	1	Rochester, University of,	1
France, University of,	1	Rutgers College,	2
Furman University, (S. C.)	1	South Carolina, University of,	1
Harvard University,	4	Stevens Inst. of Technology,	2
Haverford College,	1	Tokio, University of, (Japan)	1
Iowa College,	1	Virginia, University of,	5
Johns Hopkins University,	2	Wesleyan University,	1
Lafayette College,	3	Williams College,	3
Marietta College,	1	Yale College,	7

TERMS AND REGULATIONS.

1. The application must be made in writing.

2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.

3. The value of each Fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the Fellowship, payments will be made for the time during which the office may have been actually held.

4. Every holder of a Fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the University, as circumstances may suggest. He must reside in Baltimore during the academic year.

5. He will be expected to devote his time to the prosecution of special study, (not professional) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.

6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.

7. He may be re-appointed at the end of the year.

8. The appointments for 1880-81, were as follows:

In Mathematics, four; Languages, five; Chemistry, three; Physics, three; Biology, three; Philosophy, two.

9. *Applications for the next year should be made prior to May* 13, 1881.

F.

Report of Chesapeake Zoölogical Laboratory.

FOR THE THIRD YEAR.

Summer of 1880, Beaufort, N. C.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Third Session of the Chesapeake Zoölogical Laboratory.

By the liberality of the Trustees, I have been enabled to spend a much longer period than hitherto at the seaside, and have been provided with a more liberal outfit, including a steam launch which was built, for our use in the last spring, at Bristol, R. I., and has proved a very efficient auxiliary. The necessary books, dredges, and other instruments were also provided by the University. In addition to the opportunities afforded to three of the members of our own academic staff, three other gentlemen, devoted to the study of Zoölogy, were invited to avail themselves of the scientific facilities of the station.

The laboratory was opened at Beaufort, N. C., on April 23, 1880, and closed on September 30, after a session of twenty-three weeks. It was supplied with working accommodations for six investigators, and the facilities which it afforded were used by the following six persons:

W. K. BROOKS, PH. D.
Director.

K. MITSUKURI, PH. B.
Fellow in Biology.

E. B. WILSON, PH. B.
Fellow in Biology.

F. W. KING, A. M.
Professor of Natural Science, Wisconsin State Normal School.

H. C. EVARTS, M. D.
Academy of Natural Sciences, Philadelphia.

H. F. OSBORNE, PH. D.
Fellow of the College of New Jersey.

Beaufort was selected for our third season's work because it is the nearest accessible town, south of Baltimore, which is favorably situated for zoölogical study. The advantages of a location in a town are well shown by the fact that the expenses of a session of twenty-three weeks this year were considerably less than those of a ten weeks session the year before.

The scientific advantages of Beaufort are very great; the most important is the great difference between its fauna and that of our northern Atlantic coast.

The configuration of our coast line is such that Cape Hatteras, the most projecting point south of New York, deflects the warm water of the Gulf Stream away from the coast, and thus forms an abrupt barrier between a cold northern coast and a warm southern one. The fauna north of this barrier passes gradually into that of southern New England, while the fauna south of the barrier passes without any abrupt change into that of Florida, but the northern fauna is sharply separated by Cape Hatteras from the southern.

As the laboratory of the U. S. Fish Commission and Mr. Agassiz's laboratory at Newport afford opportunities for work upon the northern fauna, it seemed best for us to select a point south of Cape Hatteras in order to study the southern fauna with the same advantages, and as Beaufort is the only town near the Cape which can be reached without difficulty, it was chosen as the best place for the laboratory.

The situation of this town is exceptionally favorable for zoölogical work, for the surrounding waters present such a diversity of conditions that the fauna is unusually rich and varied.

Close to the town there are large sand bars, bare for miles at low tide, and abounding in animal life. From these we could collect an unfailing supply of Amphioxus, Renilla, Limulus, Balanoglossus, Sea Urchins, and a great variety of Molluscs and Crustacea.

The mud flats furnished us with another fauna, and yielded a great variety of Annelids, a new set of species of Crustacea and Molluscs, Gephyreans, Echinoderms, and Polyps. The large salt marshes gave us a third fauna, and a short distance inland large swamps of brackish and fresh water furnished still other conditions of life.

As the town is situated at the point where Gore Sound connects Pamlico Sound with Bogue Sound we were within easy reach of a continuous sheet of landlocked salt water more than a hundred miles long, and these Sounds furnished still another collecting and dredging ground, abounding in Corals, Gorgonias, Ascidians, Star Fish, Sea Urchins, and a new set of Molluscs and Crustacea.

As most of the shores are flat and sandy those animals which live upon a sandy bottom are much more abundant than those which attach themselves to solid bodies, but the stone breakwaters at Fort Macon, the wharves at Beaufort and Morehead City, and the large oyster beds which are found in the sounds furnish a proper habitat for many fixed animals, and yielded us a rich supply of Hydroids, Corals, Ascidians, Sea Anemones, Sponges, Cirrhipeds, &c. The ocean beach within a short distance of the town furnished still another fauna, and a sail of three miles from the laboratory carried us to a good locality for ocean dredging.

The greatest advantage of the locality is the richness of its pelagic fauna. There are very few points upon land which are so situated that the surface

animals of mid-ocean can be procured in abundance for laboratory work, and as careful work is very difficult on shipboard, a laboratory which can be furnished with a good supply of living pelagic animals presents opportunities for work in an extremely interesting and almost new field.

The Gulf Stream is constantly sweeping these animals northwards along the North Carolina coast, and as the tide sets in through Beaufort Inlet into the Sounds the floating animals are carried with it. Such oceanic animals as Physalia and Porpita were frequently thrown, uninjured and in perfect health, upon the beach within twenty feet of the laboratory, and during the season we found nearly all the Siphonophoræ which are known to occur upon our Atlantic coast.

With all these advantages we enjoyed a mild and uniform climate which enabled us to work in perfect comfort during the hottest months of summer.

The zoölogical resources of Beaufort have not escaped the attention of American naturalists, and there are few places upon our coast, outside of New England, where more zoölogical work has been done. In 1860, Drs. Stimpson and Gill spent a season in dredging and collecting in the vicinity of Beaufort, Cape Lookout and Cape Hatteras, and an account of their work was published in the American Journal of Science. Dr. Coues, who was stationed at Fort Macon during the war, occupied himself for two years in collecting the animals which are found here, and he published a series of papers on the "Natural History of Fort Macon and Vicinity" in the Proceedings of the Academy of Natural Sciences of Philadelphia.

These papers, which were continued by Dr. Yarrow, contain copious and valuable notes on the habits and distribution of the animals which were observed, and we found them a great help to us. These two naturalists found four hundred and eighty species of animals in the vicinity of Beaufort. Of these four hundred and eighty, two hundred and ninety-eight are vertebrates, and one hundred and eighty-two are invertebrates. Of the vertebrates twenty-four are mammals, one hundred and thirty-three are birds, twenty-seven are reptiles, six batrachians, ninety-seven fishes and eleven selachians. Of the invertebrates one hundred and forty-seven are molluscs, twenty-one are crustaceans. The list of vertebrates is very nearly exhaustive, and we made no additions to it, but the list of invertebrates is obviously very imperfect, and, although we made no attempt to tabulate the species which we observed, there would be no difficulty in enlarging list the twenty or thirty fold.

Among other naturalists who have spent more or less time at Beaufort I may mention Professor L. Agassiz, Professor E. S. Morse, Dr. A. S. Packard, Professor Webster, and Professor D. S. Jordan. Professor Morse procured most of the material for his well known paper on the Systematic Position of the Brachiopoda on the sand bars in Beaufort Inlet.

I will now attempt to give a very short statement of some of the leading points in our own summer's work. Much of our time was spent

in studying the development of the Crustacea, since this is one of the most important fields for original work upon our southern coast. The supply of material is almost inexhaustible, and would employ a number of students for many years. The life history of the Crustacea is of great interest in itself, and the recent species are so numerous and diversified that there is no group of animals better adapted for studying the general laws of embryonic development in their relation to the evolution of the group.

These considerations have led us to devote especial attention to this group during this and the preceding seasons. One of the published results of the first season's work was an illustrated account of the metamorphosis of Squilla, a representative of a somewhat aberrant group of Crustacea. During the second season, a member of our party, Professor Birge, made a very thorough study of the development of Panopæus, one of our crabs, and the account of his observations, with drawings, was ready for publication several months ago. At Beaufort, we spent most of our time upon this subject, and figured more than eight hundred points in the development of various Crustacea.

Among these, I wish to call especial attention to our observations upon the development of the Sergestidae; the least specialized of the stalk-eyed Crustacea. This very peculiar group was not known to occur upon our coast until we found a few specimens of one genus at Fort Wool, and the same genus—Lucifer—in great abundance at Beaufort, associated with another genus which is also new to North America. As nothing whatever was known of the development of Lucifer, we made every effort to obtain the eggs and young, and after four months of almost fruitless labor we finally succeeded in finding all the stages of the metamorphosis, and figured them in a complete series of ninety-nine drawings. We also obtained a somewhat less complete series of figures of stages in the life history of the second Sergestid.

Our only motive in this work was the desire to fill a gap in our knowledge of crustacean development, by supplying the life history of a very interesting group of animals, but the result was found to have a very unexpected value, since it contributes to the discussion of a number of problems in general embryology and morphology, and is the most significant crustacean life history which has ever been studied.

The following are some of the more important points:

The egg undergoes total regular segmentation.

There is no food yolk, and cleavage goes quite through the egg.

There is a true segmentation cavity.

Segmentation is rhythmical.

There is an invaginate gastrula.

The larva leaves the egg as a Nauplius, and passes through a protozoea stage, and a schizopod stage.

The fifth thoracic segments and appendages are entirely wanting at all stages of development.

Another interesting group which was studied is the Porcellanidae; the least specialized of the true crabs. The adults of our American species are almost restricted to our southern waters, although the swimming larvæ are carried north by the Gulf Stream. Within the last two years two northern naturalists have studied these floating embryos upon the south coast of New England, but as they were working upon stragglers so far from home their accounts are incomplete and somewhat contradictory. Our advantages at Beaufort enabled us to contribute towards the solution of this confused subject by raising one species of Porcellana from the egg.

We also raised six other species of crabs from the egg, and made drawings of the more important stages of development. One of the species which was thus studied is the edible crab. Its metamorphosis has never been figured, and although it presents no unusual features, its economic importance gives value to exact knowledge of its life history.

Mr. Wilson also studied the development of one species of Pycnogonida, a group of very peculiar Arthropods, distantly related to the spiders. As he has paid especial attention to the systematic study of this group, and is now engaged in describing the Pycnogonids collected in the Gulf Stream by Mr. Agassiz, the opportunity to study them alive in the laboratory has been a great advantage to him.

Another important investigation is the study, by Mr. Wilson, of the embryology of the marine Annelids. Although the representatives of this large group are abundant and widely distributed, little was known of the early stages of their development until he procured the eggs of several species and studied them at Beaufort. This investigation has shown, among other things, that the accepted division of Annelids into two great groups, the Oligochæta and Polychæta, is not a natural method of classification. The work upon the development of marine Annelids was supplementary to an investigation which Mr. Wilson carried on last spring at Baltimore, and which he will continue this winter, upon the development of land and fresh-water Annelids.

As much time as possible was given this season to the study of the hydroids and jelly-fish of Beaufort. The life history of several of them were investigated, a thorough anatomical study of some of the most important forms was carried on, and nearly two hundred drawings were made. It is almost impossible to complete a study of this kind in a single season, but if one or two more summers can be given to the work, we have every reason to hope for valuable results, for although the North Carolina coast is the home of many species which are only found as stragglers upon our northern coast, and of other species which are not known to occur anywhere else, and of some genera and families which are new to the North American coast, this field has suffered almost total neglect.

Nearly three months of the time of two members of our party, Mitsukuri and Wilson, were given to the study of the habits, anatomy and

development of Renilla, a compound Polyp very much like that which forms the precious coral, but soft and without a stony skeleton. The animals which form the community are so intimately bound together that the community, as a whole, has a well marked individuality distinct from that of the separate animals which compose it. The compound individuality of Renilla is quite rudimentary as compared with that of a Siphonophore, and as there is no trace of it in the closely allied Gorgonias, it furnishes an excellent field for studying the incipient stages in the formation of a compound organism by the union and specialization of a community of independent simple organisms. With this end in view the anatomy of the fully developed community was carefully studied, and the formation of a community was traced by rearing a simple solitary embryo in an aquarium until a perfect community had been developed from it by budding. During the process of development the law of growth by which the characteristics of the compound organism are brought about was very clearly exhibited, and it is fully illustrated by nearly one hundred drawings.

One of the most interesting results of our work is the explanation by Mr. Wilson, of the origin of the metamorphosis of the larva of Phoronis, a small Gephyrean worm which lives in a tube. Several of the most noted embryologists of Europe have studied the development of Phoronis, and our knowledge of its life history is due to their combined labors. Last summer Mr. Wilson reviewed the subject, and added some important points, and during the present season he has shown by the comparison of a great number of allied forms, that the very peculiar metamorphosis admits of an extremely simple explanation. The adult is sedentary and confined to its sand tube, while the larva is a swimming animal totally different in structure. The change from the larva to the adult is very rapid and violent. It occupies only a few minutes, and during the change the larva becomes turned wrong side out, so that what was internal is external. Mr. Wilson's comparison shows that Phoronis was originally a free animal, and that the structural peculiarities which fit the adult for sedentary life in a tube are of recent acquisition. The larva has however retained its ancestral adaptation to a swimming life in order to provide for the distribution of the species. There must have been a time, in the evolution of the species, when the adult was imperfectly adapted to a sedentary life, and also imperfectly adapted to a swimming life, and if the development of the individual were a perfect recapitulation of all the stages in the evolution of the species, we should have, between the swimming larva and the sedentary adult, a stage of development during which the adaptation is not quite perfect for either mode of life. It is clearly an advantage for the animal to pass through this stage as quickly as possible, or to escape it altogether. The peculiar metamorphosis enables the larva to remain perfectly adapted to a locomotor life until the occurrence of the sudden change which fits it for life in a tube, and Mr. Wilson has pointed out the manner in which the metamorphosis

has been acquired in order to bridge over the period of imperfect specialization. This explanation is somewhat similar to that which Lubbock has given of the origin of the metamorphosis of insects, and we may hope that the same method of investigation will throw light upon the significance of other remarkable instances of metamorphosis in the invertebrates.

During the summer, the following abstracts of some of the more important points in our work have been published in scientific journals:

The Development of the Cephalopoda and the Homology of the Cephalopod Foot. By W. K. BROOKS. *Amer. Journal of Science.*

The Development of Annelids. By E. B. WILSON. *Amer. Journal of Science.*

The Rhythmical Nature of Segmentation. By W. K. BROOKS. *Amer. Journal of Science.*

The Origin of the Metamorphosis of Actinotrocha. By E. B. WILSON. *Amer. Assoc., Boston Meeting.*

Notes on the Medusae of Beaufort. By W. K. BROOKS. *Amer. Assoc., Boston Meeting.*

Budding in Free Medusae. By W. K. BROOKS. *Amer. Naturalist.*

Development of Marine Polychætous Annelids. By E. B. WILSON. *Zoölogischer Anzeiger.*

Embryology and Metamorphosis of Lucifer. By W. K. BROOKS. *Zoölogischer Anzeiger.*

The Early Stages of Renilla. By E. B. WILSON. *Amer. Journal of Science.*

Other abstracts are now in press, and others are ready for publication. A paper, with four plates, on the "Early Stages of the Squid," is also in press, and will soon be issued in the Memorial Volume of Memoirs of the Boston Society of Natural History.

Yours, respectfully,

W. K. BROOKS,

Director of the Chesapeake Zoölogical Laboratory and Associate in Biology.

SUMMER SEASIDE INSTRUCTION AT FORT WOOL.

In addition to the work of the Chesapeake Zoölogical Laboratory, a class for beginners was conducted at Fort Wool, Va., by Dr. S. F. Clarke, Assistant in the Biological department, during six weeks from July 15, 1880. From his report to the Trustees it appears, that permission having been obtained from the Government, through the courtesy of Major

General Q. A. Gillmore, U. S. A., to use the buildings at Fort Wool during the summer, it was announced by circular that the school would open with accommodations for ten. A good outfit, including Microscopes, Aquaria, Dredges, Nets, Library, etc., having been furnished by the University, the session began July 15th, for a term of six weeks.

The aim and object of the enterprise was to furnish for those who are so interested, an opportunity to become acquainted with the elements of Zoölogy, by a study of the marine animals found in the Chesapeake.

Instruction was given by means of lectures and laboratory direction, and also by daily collecting and observing the various animals in their native haunts. The lectures, twenty-seven in number, extended through the session.

So varied is the animal life about Fort Wool, that the director was able to have on the table, at every lecture, living specimens of the forms under discussion. The party consisted of:

S. F. Clarke, *Director.*	H. A. Stokes, B. S.
W. H. Howell, *Assistant.*	H. L. Price.
E. M. Hartwell, A. M.	L. T. Stevens.
Henningham Gordon, A. B.	Wheelock Rider.

Six are from the Johns Hopkins University; Mr. Gordon is an Instructor in the Baltimore City College, and Mr. Rider is of the Rochester University, New York.

G.

List of Donors to the Library, September 1, 1879, to September 1, 1880.

American Institute of Mining Engineers. Transactions. Vol. 7. Phila. and Easton: 1879. O.

American Committee of Bible Revision. Anglo-American Bible Revision. New York: 1880. D.

Ammen, D., Rear Admiral, U. S. N. (Author). The American Oceanic Ship-canal Question. Phila.: 1880. O.

Archæological Institute of America. First Annual Report. Cambridge: 1880. O.

Barker, Fordyce, M. D. Proceedings of New York Academy of Medicine. New York: 1880. O.

Barron, J. H., Supt. Public Property. Geology of Wisconsin. 3 vols. and atlas. Madison, Wis.: 1880. O.

Beer, R. K., M. D. Henle's Anatom. Hand-atlas. Part I. Braunschweig: 1871. O.

Boss, L. Declinations of Fixed Stars. Washington: 1877. Q.

Bowditch, J. Ingersoll. The Mécanique Céleste of La Place, translated with comm. by Nathaniel Bowditch. 4 vols. Boston: 1829-39. Q.

Browne, Wm. Hand, M. D. Plutarchi Opera. 12 vols. Frankfurt: 1599. F.

Chadwick, J. R., M. D., Secretary. Transactions of American Gynecological Society. Boston: 1877-79. O.

Cook, G. H., State Geologist of N. J. Annual Report for 1879. Trenton: 1879. O.

Council of Education, New South Wales. Report for 1878. Sydney: 1879. O.

Darby, J. C., M. D. (Author). Science and the Healing Art. Louisville: 1880. O.

Directors St. Louis Public Schools. Twenty-fifth Annual Report. St. Louis: 1880. O.

Gage, S. H. (Author.) The Ampulla of Vater and Pancreatic Ducts in the Cat. New York. O.

GASPARIN, LA COMTESSE DE. Le Cte. Agénor de Gasparin. Par T. Borel. Paris: 1879. D.

GARRETT, J. HARRISON. Bibliography of B. & O. Railroad, 1827 to 1879. Compiled by J. W. M. Lee. Baltimore: 1879.

GRANT, S. H. Report New York Produce Exchange. New York: 1880.

GREENWAY, E. M. JR. Words, their History and Derivation. By F. Ebener and E. M. Greenway, Jr. Baltimore: 1871. Q.

HALE, REV. C. R., D. D. Fac-similes of Church Documents. 1874-79. O.

HALLOWELL, H. C. Euler, L. Elements of Algebra. London: 1797. O.
Biot, J. B. Géometrie Analytique. Paris: 1826. O.
Lacroix, S. F. Traité du calcul diff. et int. Paris: 1828. O.
Feuchtwanger, L. Treatise on Gems. New York: 1858. O.
Emerson, W. Projection of the Sphere. London: 1769. O.
Stewart, M. Tracts, physical and mathematical. Edinburgh: 1761. O.
Vince, S. Principles of Fluxions. Phila. 1812. O.
Simson, R. Conic Sections. Phila.: 1809. O.
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IV.

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Edited by Prof. MARTIN, *including the Scientific Results of the Chesapeake Zoölogical Laboratory, 1878, 1879, edited by* DR. W. K. BROOKS. Vol. I, 1879–80.

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This Report covers the Academic year ending September 1, 1880. The Appendix contains some statements of a more recent date.

SIXTH ANNUAL REPORT

OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore Maryland

1881

SIXTH ANNUAL REPORT

OF THE

Johns Hopkins University

Baltimore Maryland

1881

BALTIMORE
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET
1882

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* Hon. George W. Dobbin was elected President of the Board of Trustees, April 4, 1881, in place of Galloway Cheston, deceased. Mr. Lewis N. Hopkins was elected Secretary, February 6, 1882, in place of William Hopkins, deceased. Mr. J. Hall Pleasants and Dr. Alan P. Smith were elected, November 7, 1881, to fill the vacancies in the Board.

SIXTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University:

In presenting the Sixth Annual Report of the Johns Hopkins University,—it does not seem important to describe the origin and growth of this foundation, for that has been done in the preceding reports; and accordingly I shall aim at the present time simply to recapitulate the facts which mark our progress in the year ending September 1, 1881. We have seen no reason to depart from the principles originally laid down, and we have already reached some of the results at which we have been aiming. The university courses continue to draw students from every part of the country and the collegiate courses are obviously acceptable to the youth of Baltimore for whose especial benefit they have been maintained. The authorities of the university attach much importance to the collegiate department, and do not doubt that it will continue to grow in public estimation as its methods and results become more generally understood.

The academic staff included during the year thirty-nine teachers, four of whom were non-resident

lecturers and two non-resident associates. In addition to this staff, five professors, not otherwise connected with the university, acted as examiners in particular subjects where their judgment was sought. The number of students enrolled during the year was one hundred and seventy-six, of whom ninety-five were residents of Maryland and eighty-one came here from twenty-one states of the union and from four foreign countries. Among the students were one hundred and two already graduated, representing forty-six colleges and universities; there were thirty-seven matriculates, (or candidates for the degree of Bachelor of Arts), and there were thirty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The daily attendance upon eighty-two public lectures was one hundred and eighty-six,—ascertained by the count of the door-keeper. Besides the classes of students above mentioned, twelve teachers attended a course in Latin, meeting on Saturdays, and a company of fourteen, an exercise in Biblical exegesis.

The following table indicates the enrollment since the university was opened in the autumn of 1876.

	Graduates, (incl. Fellows.)	Matriculates.	Non-Matriculates.	Total Enrolled.	Average Attendance at Public Lectures.
1876-77	54	12	23	89	60
1877-78	58	24	22	104	84
1878-79	63	25	35	123	96
1879-80	79	32	48	159	113
1880-81	102	37	37	176	186

The attendance upon some of the principal courses during the last three years has been as follows:

	1878-79.	1879-80.	1880-81.
Mathematics,	38	31	31
Physics,	32	38	35
Chemistry,	39	46	40
Biology,	26	32	25
Greek,	40	36	31
Latin,	27	40	40
German,	55	60	55
French, Italian, etc.	18	39	33
English,		19	29
History, etc.		33	40
Logic,	6	16	13
Philosophy and Ethics,	6	12	14

The total number of individuals enrolled as students upon our books prior to September 1, 1881, is three hundred and seventy; of this number there came from Maryland two hundred and twelve, including one hundred and seventy-four from Baltimore; the other students came from thirty-four states and countries. Two hundred and twenty-seven persons have pursued courses as graduate students, and one hundred and forty-three as collegiate students.

Further statistical information may readily be found by consulting the annual Register, and the Official Circulars which appear from time to time; in this place it seems desirable to call attention to the actual instruction which was given during the past academic year. Every instructor has been

free (subject of course to the general plans of the university) to employ whatever agencies seemed most likely to benefit the class which came to him, and hence a great variety of educational forces have been constantly at work among us. Recitations and lectures are, as elsewhere, the ordinary means of instruction; the three laboratories, constantly open, have given to the students of chemistry, physics, and biology opportunity both for elementary training and for observing, or for participating in original investigations; in mathematics, languages, and history, seminaries have been conducted for the purpose of showing advanced students the processes by which independent researches are to be carried on; public lectures have been provided to present the more popular and general aspects of various literary and scientific inquiries; several societies, presided over by the instructors, have held their meetings regularly for the reading of communications and for comment upon them; there are three reading clubs whose aim is to make a constant review of the higher current scientific literature; there is a field-club for the out-door observation of nature in the vicinity of Baltimore; during the summer, a marine station is maintained upon the coast of North Carolina for the prosecution of zoölogical work; and the library, with its constant reception of new books,—German, French, English, and American publications, is constantly open from

early morning to the late evening. Besides all this, the teachers are encouraged to do whatever they can for the advancement of the sciences to which they are devoted, and the university has contributed liberally to the publication of results.

The following tables which have been carefully prepared from the records filed in the registrar's office indicate the number of attendants in each department of study, the number in each class, the name of the teacher, and the number of appointments for each course.

Courses of Instruction.

The instruction in Mathematics was under the direction of Professor Sylvester, aided by W. E. Story, Ph. D., F. Franklin, Ph. D., and T. Craig, Ph. D. The entire number of students was thirty-one and their distribution is indicated in the following list:

Mathematical Seminary (22). *Monthly, through the year.*

Theory of Numbers (6). *Twice weekly, through the year: Professor Sylvester.*

Problems of Mathematics (5). *Weekly, through the year: Dr. Story.*

Higher Plane Curves [Advanced Course] (5). *Twice weekly, through the year: Dr. Story.*

Mechanics (6). *Twice weekly, through the year: Dr. Story.*

Higher Plane Curves [Elementary Course] (3). *Three times weekly, second half-year: Dr. Story.*

Solid Analytic Geometry (5). *Four times weekly, second half-year: Dr. Story.*

Conic Sections (10). *Three times weekly, through the year: Dr. Story.*

THEORY OF FUNCTIONS (3). *Three times weekly, first half-year: Dr. Craig.*

PARTIAL DIFFERENTIAL EQUATIONS (5). *Twice weekly, second half-year: Dr. Craig.*

DETERMINANTS (9). *Twice weekly, first half-year: Dr. Franklin.*

MODERN ALGEBRA (6). *Twice weekly, second half-year: Dr. Franklin.*

DIFFERENTIAL CALCULUS (6). *Three times weekly, first half-year: Dr. Franklin.*

INTEGRAL CALCULUS (5). *Three times weekly, second half-year: Dr. Franklin.*

THEORY OF EQUATIONS (5). *Twice weekly, through the year: Dr. Franklin.*

ORDINARY DIFFERENTIAL EQUATIONS (4). *Three times weekly, second half-year: Dr. Franklin.*

The results of special studies have been examined and discussed in the SEMINARY, during the year, under the direction of Professor Sylvester, as follows:—

By J. J. Sylvester, on the resultant of two congruences; on the multisection of the roots of unity; on the prerogative of a ternary denominational system of coinage;—by W. E. Story, on a notation for totients; on two kinds of k-th totients; outline of Clebsch's and Gordan's method of finding the groundforms of a binary quartic;—by T. Craig, a proof of Abel's theorem;—by C. S. Peirce, proof that there are only three linear associative algebras in which division is an unambiguous process;—by F. Franklin, a deduction from the properties of a system of three circles; on v. Gall's table of groundforms for the octavic; a new proof of Euler's development of the infinite product $(1-x)(1-x^2)(1-x^3)\ldots$; on Newton's method of approximation;—by A. S. Hathaway, upon the similarity between congruences and equations, and its significance; the cyclotomic functions, with respect to a prime modulus p; on modular functions;—by O. H. Mitchell, on the properties of the roots of $x^2 \equiv x$ mod. k; a theorem including Fermat's and Wilson's theorems; on binomial congruences, (mod. p, $f(x)$);—by H. M. Perry, on a rule of signs in determinants;—by R. W. Prentiss, a problem in maxima and minima; a geometric locus;—by C. A. Van Velzer, on certain compound determinants. Abstracts of these papers have been printed in the *University Circulars*.

In Physics, under the direction of Professor Rowland, there were thirty-five students. The courses in General Physics were given by C. S. Hastings, Ph. D., lectures on Hydrodynamics were given by Thos. Craig, Ph. D., and the chief assistant in the

laboratory was E. H. Hall, Ph. D. The attendance was as follows:

LABORATORY WORK FOR ADVANCED SPECIAL STUDENTS (5). *Daily, through the year: Professor Rowland.*

ELECTRICITY AND MAGNETISM (5). *Four times weekly, through the year: Professor Rowland.*

HYDRODYNAMICS (5). *Four times weekly, through the year: Dr. Craig.*

MAJOR COURSE (10). *Lectures, weekly through the year, and daily work in the Laboratory, especially on Wednesdays: Dr. Hastings.*

GENERAL PHYSICS [Elementary Mechanics, Acoustics, Heat, Magnetism, Electricity, and Light] (16). *Daily, through the year, with a weekly exercise in the Laboratory: Dr. Hastings and Dr. E. H. Hall.*

READING AND DISCUSSION OF CURRENT PHYSICAL JOURNALS (6). *Weekly, through the year.*

PUBLIC LECTURES:

The Sun and Radiant Energy (207). *Six lectures: Prof. S. P. Langley.*

The Conservation of Energy (183). *Four lectures: Professor Rowland.*

Light (208). *Four lectures: Dr. Hastings.*

The Photophone and Spectrophone (235). *One lecture: Dr. A. Graham Bell.*

The researches carried on in the LABORATORY (which has been open for eight hours daily) by the Fellows and advanced students, under the direction of Professor Rowland, included the following subjects:—

The new action of magnetism on electric currents discovered by Dr. E. H. Hall; a determination of the mechanical equivalent of heat by electrical means; the study of the supposed generation of electricity by evaporation, etc.; on the diamagnetic constants of bismuth in absolute measure, etc.

The courses in Chemistry were attended by forty students and were conducted by Professor Remsen, and H. N. Morse, Ph. D., as follows:

GENERAL CHEMISTRY [NON-METALS] (22). *Four lectures by Professor Remsen and two examinations by Dr. Morse, weekly, first half-year.*

GENERAL CHEMISTRY [METALS] (14). *Four lectures and two examinations weekly, second half-year: Dr. Morse.*

CHEMISTRY OF CARBON COMPOUNDS (12). *Four times weekly, second half-year: Professor Remsen.*

ANALYTICAL CHEMISTRY (7). *Three times weekly, first half-year: Dr. Morse.*

LABORATORY WORK (39). *Daily, through the year: Professor Remsen and Dr. Morse.*

READING AND DISCUSSION OF CURRENT CHEMICAL JOURNALS. *Twice weekly, through the year.*

PUBLIC LECTURES:

Selected Topics in Chemistry (229). *Four lectures: Professor Remsen.*

The Fellows and advanced students have been engaged in the LABORATORY (which has been open for eight hours daily) in carrying on, under the direction of Professor Remsen, the following investigations, most of which either have been or soon will be published:—

On the conduct of finely divided iron toward nitrogen; on chemical action in a magnetic field; on the structure of mesitylenic sulphinide; on the oxidation of nitrometaxylene; on the sulphocinnamic acids; on the oxidation of metatoluene-sulphamide; a comparative study of sulphoisophthalic and sulphinido-isophthalic acids; on *a*-osyisophthalic acid; on phthalimide; transformations of formylorthotoluidine; on the separation of barium from calcium, strontium, and magnesium; on the estimation of chromium in chrome-iron ore; an examination into the methods now in use for the detection of carbon monoxide (carbonic oxide) in the air of rooms heated by hot air furnaces and cast-iron stoves, (for the National Board of Health); a portion of the work of an investigation on the methods for the estimation of organic matter in potable waters, (for the National Board of Health.) The entire water supply of Baltimore having become contaminated during the winter of 1880–81, the Mayor and Water Board requested Professor Remsen to make a thorough examination of the water and to report to them. This work was carried on in the laboratory, and an elaborate report was published.

The work in Biology was under the direction of Professor Martin. W. K. Brooks, Ph. D., lectured on Osteology, and instruction was also given by H. Sewall, Ph. D., and W. T. Sedgwick, Ph. D. The courses were followed by twenty-five students:

ANIMAL PHYSIOLOGY (15). *Three times weekly, through the year: Professor Martin.*

GENERAL BIOLOGY (8). *Three times weekly, to the end of April: Professor Martin.*

EMBRYOLOGY OF THE CHICK (10). *Thrice weekly, during May: Professor Martin.*

OSTEOLOGY (5). *Daily, from November to the end of April: Dr. Brooks.*

THEORY AND USE OF PHYSIOLOGICAL INSTRUMENTS (7). *Weekly, first half-year: Dr. Sewall.*

PHYSIOLOGY OF THE VOICE (8). *Weekly, second-half year: Dr. Sewall.*

HUMAN ANATOMY (3). *Three times weekly, to the end of March, with Practical Anatomy in the dissecting room: Dr. Winslow, of the University of Maryland.*

STRUCTURAL BOTANY (10). *Twice weekly, for one month: Dr. Sedgwick.*

LABORATORY WORK (24). *Daily, through the year: Professor Martin and Drs. Brooks, Sewall, and Sedgwick.*

PUBLIC LECTURES:

On the Human Body (249). *Four lectures: Professor Martin.*

The Theory of Development and its Philosophical Significance (197). *Seven lectures: Professor John McCrady, of the University of the South.*

During the year investigations have been carried on in the LABORATORY (which has been open for eight hours daily) on the following subjects, and articles based on them either have been or soon will be published:—

The blood pressure and pulse in the coronary arteries of the heart; a method of isolating the mammalian heart and keeping it alive for study; the influence of variations of temperature on the pulse rate of the isolated mammalian heart; the influence of variations in arterial pressure on the pulse rate of the isolated mammalian heart; the normal temperature of the rabbit and its diurnal variations; the anatomy and physiology of parts of the nervous system of the terrapin; the interaction of weak induction currents passed simultaneously through a nerve; the histological changes occurring in pepsin glands during secretion; the mode of action on the iris of pilocarpin and other drugs; the histology of the eye of the crayfish; the development of Lucifer; the development of the crabs; the segmentation of the egg of bony fishes; report on the pycnogonids of the Blake expedition; the development of annelids; the development of the Wolffian body in amblystoma; the microscopic organisms present in various drinking waters, and the effect on animals of the injection of different drinking waters, (for the National Board of Health); the bacterial organisms present in various septic liquids, and the conditions leading to their development and destruction, (for the National Board of Health); the development of starch granules.

During the summer of 1881, the CHESAPEAKE ZOÖLOGICAL LABORATORY, for the study of forms of marine life, was conducted at Beaufort, N. C. The report of its Director is given in the appendix.

The instruction in Greek was under the direction of Professor Gildersleeve. The collegiate classes were conducted by Professor C. D. Morris. The attendance was thirty-one:

GREEK SEMINARY (14). *Twice weekly, first half-year; thrice weekly, second half-year: Professor Gildersleeve.*

LECTURES ON GRAMMAR (17). *Once weekly, first half-year; twice weekly, second half-year: Professor Gildersleeve.*

COMPOSITION AND TRANSLATION (15). *Twice weekly, first half-year: Professor Gildersleeve.*

SOPHOCLES, Electra, Antigone (10). *Four times weekly, first half-year: Professor C. D. Morris.*

HERODOTUS, bks. iii, iv (6). *Four times weekly, first half-year: Professor C. D. Morris.*

THUCYDIDES, bk. iv (4). *Four times weekly, second half-year: Professor C. D. Morris.*

EURIPIDES, Alcestis, Hippolytus (5). *Four times weekly, second half-year: Professor C. D. Morris.*

PROSE COMPOSITION. *Two classes, each weekly, through the year: Professor C. D. Morris.*

NEW TESTAMENT EXEGESIS (4). *Daily, through the year: Mr. Cross.*

Students have privately read for examination the following books:

HERODOTUS, bks. i, ii (1); bks. v, vi, vii (2); bks. v, vi, vii, viii, ix (1); bks. vi, vii, viii, ix (1); bks. viii, ix (1).

EURIPIDES, Alcestis (2).

HOMER, Odyssey, bks. i-xii (1).

A course of ten lectures on Biblical Exegesis was given by Mr. Cross, with an average attendance of fourteen.

During the session of 1880–81, the SEMINARY was mainly engaged in the study of the Greek orators, especial attention being paid to the development of language and style and to the antique canons of aesthetic criticism. The members of the seminary were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to prepare historical introductions, to make analyses of speeches and abstracts of rhetorical treatises. Parts of Antiphon, Andokides, Lysias, Isokrates, Isaios, and Demosthenes were studied in this way, and some of the minor orations of the four last named were compared with one another in connection with the *iudicia* of Dionysios of Halikarnassos. Besides this general work, subjects of special study in the orators were assigned to individual members of the seminary, and an effort was made to insure a personal acquaintance on the part of all the students with the works of all the orators of the Attic canon. Introductory lectures, informal examinations, and conferences were also held by the Director at suitable points in the course. Of the investigations which were carried on may be noted:—

Studies on the nominal periphrases for the verb in Antiphon and Thukydides; on the genuineness of the first Antiphontean oration; on synonyms in Antiphon; on the use of the locative formations of *πρίν*, and of *ἐπί* in the orators; an elaborate statistic of certain syntactical characteristics of Andokides; an inquiry into the influence of technical rhetoric on the *ῥήσεις* of the Attic drama. Special work was also done in Isaios, Lykurgos, and Deinarchos.

In Latin, the classes were conducted by Minton Warren, Ph. D., with the assistance of Mr. G. H. Stockbridge, with an attendance of forty students:

LATIN RHETORICIANS (13). *Weekly, from October to March: Dr. Warren.*

TERENCE (14). *Weekly, through the year: Dr. Warren.*

TACITUS (14). *Four times weekly, first half-year: Dr. Warren.*

SELECT LETTERS OF CICERO AND PLINY (11). *Four times weekly, second half-year: Dr. Warren.*

COMPOSITION AND TRANSLATION (8). *Weekly, through the year: Dr. Warren.*

LIVY (14). *Four times weekly, first half-year: Mr. Stockbridge.*

HORACE (11). *Four times weekly, second half-year: Mr. Stockbridge.*

PROSE COMPOSITION (12). *Weekly, through the year: Mr. Stockbridge.*

Students have privately read for examination the following books:

LUCRETIUS, bks. ii, iv, vi (1).

CÆSAR, Bellum Civile (6).

LIVY, bks. iii, iv (1); bk. xxi (3); bk. xxiii (2); bks. xxiii, xxiv (1); bks. xxiii, xxiv, xxv (3).

HORACE, Odes, bks. iii, iv, Epodes, Carmen Saeculare (1); Odes, bk. iv, Satires (1).

TACITUS, Histories, i, ii (3).

TERENCE, Andria, Phormio, Eunuchus (1),

A teachers' class in the Elements of Latin was conducted by Professor C. D. Morris, on successive Saturdays, for a course of twenty lessons, with an attendance of ten.

The instruction in German was under the charge of Mr. H. C. G. Brandt, with the assistance of Mr. G. H. Stockbridge. Fifty-five students attended the classes:

GOTHIC (1). *Weekly, first half-year: Mr. Brandt.*

OLD HIGH GERMAN (2). *Twice weekly, through the year: Mr. Brandt.*

MAJOR COURSE. [Schiller's *Wallenstein* (12) and *Prosa in Auswahl* (9); Ballads (9); Goethe's *Faust* (10); Gryphius' *Peter Squentz* (9); Lessing's *Minna v. Barnhelm* (12), *Emilia Galotti* (12), and *Nathan der Weise* (12); Prose Composition and Historical Grammar (16); Middle High German, [selections from the *Nibelungenlied* and *Walther von der Vogelweide*] (11).] *Daily, through the year: Mr. Brandt and Mr. Stockbridge.*

MINOR COURSE. [Schiller's *Prosa in Auswahl* (24); Goethe's *Egmont* (19) and *Prosa* (Hart's) (15); Helmholtz's *Populäre Wissenschaftliche Vorträge*, Heft I, (20); Humboldt's *Auswahl aus seinen Werken* (20); Prose Composition and Grammar (21).] *Daily, through the year: Mr. Brandt and Mr. Stockbridge.*

A company of advanced students met weekly through the year, for philological and literary study under Mr. Brandt, who lectured upon German Literature; lectures upon Grimm's and Verner's Laws were given by Mr. Bright, and essays were read by the students upon the principal plays of Lessing, Schiller, and Goethe.

In the Romance Languages (including Modern French) there were thirty-three students. Three of these were pursuing studies of an advanced philological character, under Mr. A. M. Elliott, and the remainder followed the major and minor courses, under Mr. Elliott, and Mr. P. B. Marcou, who taught the Modern French. Lectures in French Literature were given by M. Rabillon.

LOW LATIN AND PORTUGUESE [Seven *Inscriptions* taken from Le Blant; the *Charter* of Bruyères-le-Châtel, A. D. 670–71; eight *Formulae Andegavenses;* one *Judicius penetencialis* taken from Mabillon; one *Joca monachorum;* the *Probi appendix;* the Reichenau Glossary. Seven cantos of *Os Lusiadas*] (3). *Twice weekly, through the year: Mr. Elliott.*

PROVENÇAL [Selections from the writings of *Peire Cardenal, Daude de Pradas, Guillem Figueira, Peire de Corbiac, Arnaut de Carcasses, Guiraut Riquier, Folquet de Lunel,* and *Raimon Feraut;* twenty Cartularies from the archives of various towns in the South of France] (3). *Three times weekly, first half-year, and twice weekly, second half-year: Mr. Elliott.*

MAJOR COURSE. [Italian: Dante, *Inferno*, with lectures on the *Divina Commedia* (6). Spanish: *Don Quijote* (5). French: Bartsch, *Chrestomathie de l'ancien Français* (extracts) (3); *Chanson de Roland*, extracts from *Les Tragiques* of Agrippa d'Aubigné, and the *Poésies* of Ronsard (3). A course of lectures on French Phonetics has been given weekly to a class of five students.] *Daily, through the year: Mr. Elliott and Mr. Marcou.*

MINOR COURSE. [Victor Hugo's *Ruy Blas;* Chateaubriand's *Génie du Christianisme* (8); Taine's *Révolution, Vol. I; La Poudre aux yeux,* by

Eugène Labiche and Ed. Martin; *La Bataille de Dames*, by Scribe and Legouvé (10).] *Daily, through the year: Mr. Marcou.*

FRENCH, Special Reading Class [Erckmann-Chatrian's *Hugues-le-Loup*; Ed. About's *Le Roi des Montagnes*] (4). *Weekly, through the year: Mr. Marcou.*

FRENCH, Conversation Class (6). *M. Rabillon.*

PUBLIC LECTURES (*in French*):

Satirists of France (58). *Twelve lectures: M. Rabillon.*

French Poetry, etc. (56). *Ten lectures: M. Rabillon.*

The classes in English were instructed by Mr. A. S. Cook, and were attended by twenty-nine students:

ANGLO-SAXON. *Twice weekly, first half-year* (2); *thrice weekly, second half-year* (7).

The study of Anglo-Saxon Poetry and Laws, and of Historical English Grammar was also followed by some of the more advanced students during the second half-year.

SHAKESPEARE, CHAUCER, etc. (6). *Daily, through the year.*

A class of fourteen in English Prose Style was taught during the first half-year, and a class of nine in General English Literature during the second half-year.

PUBLIC LECTURES:

Development of the Modern English Novel (195). *Twelve lectures: Mr. Lanier.*

Englishmen before the Conquest (196). *Six lectures: Mr. Cook.*

Laws of Verse (235). *One lecture: Professor Sylvester.*

The courses in History and Political Economy were taken by forty students. Classes in Constitutional History and in Modern History were directed by H. B. Adams, Ph. D. The instruction in Political Economy was given by H. C. Adams, Ph. D. Austin Scott, Ph. D., directed a class in American Constitutional History.

HISTORY OF LOCAL SELF-GOVERNMENT IN THE UNITED STATES (30). *Meeting in the Library of the Historical Society: Dr. H. B. Adams.*

After a course of lectures, investigations were undertaken upon the following topics, among others:—the parish system of South Carolina; the

county system of Virginia; the township system of Michigan and the Northwest; the municipal government of New York.

COMPARATIVE CONSTITUTIONAL HISTORY (12). *Meeting at the Peabody Institute: Dr. H. B. Adams.*

The following themes were made the subject of individual research:— a comparison between mediaeval and modern ideas of the state; influence of nationality upon state-life; relative capacity of the different races for civil society; the fourth estate in mediaeval and modern times.

AMERICAN CONSTITUTIONAL HISTORY (26). *Meeting in the Library of the Historical Society: Dr. Austin Scott.*

The constitution was studied in its adoption, and in the various phases of its development up to the final decision in the Dartmouth College case in 1819, and special topics were assigned for individual research to members of the class.

MODERN HISTORY [Modern Absolutism and Revolution] (33). *Four times weekly, first half-year: Dr. H. B. Adams.*

ELEMENTS OF INTERNATIONAL LAW (33). *Four times weekly, for two months: Dr. H. B. Adams.*

POLITICAL ECONOMY (17). *Daily, first half-year: Dr. H. C. Adams.*

FINANCE (15). *Weekly, first half-year: Dr. H. C. Adams.*

PUBLIC LECTURES:

Teutons in Church and State (212). *Five lectures: Dr. H. B. Adams.*

During the second half-year courses in the History of German Philosophy and in Aristotle's Ethics were conducted by Professor G. S. Morris, with an attendance of fourteen students.

The courses in Logic were directed by Mr. C. S. Peirce, and included daily lectures through the year. The advanced class was attended by nine and the elementary class by five students.

Classes were also instructed in Elementary Psychology, by Allan Marquand, Ph. D.; in Physiography, by S. F. Clarke, Ph. D.; in Drawing, by Mr. Hugh Newell; and in Elocution, by Mr. C. L. Woodworth.

Chesapeake Zoölogical Laboratory.

The fourth session of the Chesapeake Zoölogical Laboratory was held at Beaufort, N. C., and was attended by eleven persons. The director continues to be Dr. W. K. Brooks, whose report is given in the appendix.

Public Lectures.

The public lectures were continued during the year with unabated interest. By special request of the Trustees, a larger number than usual were given by resident members of the academic body. The subjects and lecturers were as follows:

Subject.	Lecturer.	Average Attendance.
Selected Topics in Chemistry, (4),	Ira Remsen,	229
The Human Body, (4),	H. N. Martin,	249
Light, (4),	C. S. Hastings,	208
Conservation of Energy, (4),	H. A. Rowland,	183
English Literature, (12),	Sidney Lanier,	195
Laws of Verse, (1),	J. J. Sylvester,	235
Sun and Radiant Energy, (6),	S. P. Langley,	207
Early England, (6),	A. S. Cook,	196
History of German Philosophy, (6),	G. S. Morris,	148
Teutons in Church and State, (5),	H. B. Adams,	212
Theory of Development, (7),	J. McCrady,	197
Photophone and Spectrophone, (1),	A. Graham Bell,	235
Satirists of France (*in French*), (12),	L. Rabillon,	58
French Poetry, etc. (*in French*), (10),	L. Rabillon,	56

Besides these lectures in Hopkins Hall, many of the instructors lectured by invitation before associations in different parts of the city and in its neighborhood.

INCREASE OF THE COLLECTIONS OF BOOKS AND APPARATUS.

Liberal purchases have been made for the increase of our books and apparatus. The Library now numbers ten thousand five hundred and seventy-two bound volumes, of which two thousand five hundred and forty-one have been received during the year. The university is indebted to Prince L. L. Bonaparte, for several privately printed volumes which embody his important linguistic studies, and to the heads of St. Mary's Seminary, Baltimore, and of Woodstock College for valuable theological and philosophical writings. Mr. Henry Holt, of New York, has generously given to the library copies of most of his recent standard publications,—in continuance of previous similar contributions. A remarkable collection of works on logic, made by Professor C. S. Peirce, was acquired by purchase, and additions were generously made to the collection by the same gentleman.

The reading room continues to be well supplied with the best scientific and literary periodicals, to the number of two hundred and eighty-six. In the Register for 1881, a list of these journals and of those taken in other institutions of Baltimore was printed. The entire number thus accessible is six hundred and seventy-six. The amount expended during the last five years for books and periodicals

is $32,082.92, and for apparatus $38,245.99. Beside the purchases many important instruments have been made in the mechanician's shop maintained by the university.

Publications and Societies.

The periodicals which are fostered by the funds of the university are widely circulated in other countries as well as in our own, and already many valuable publications have been received in exchange for them. The American Journal of Mathematics, edited by Professor Sylvester, has completed its third volume; the American Chemical Journal, edited by Professor Remsen, has entered on its third volume; the American Journal of Philology, edited by Professor Gildersleeve, on its second. The papers from the Biological Laboratory, under the editorial care of Professor Martin, with the aid of Dr. Brooks, have been collected in one volume, and the first part of the second volume has also been printed. An arrangement has also been made with the Journal of Physiology, of Cambridge, England, by which it is now published in this country under the auspices of this institution.

Current information regarding the university (including reports of important communications to the various societies here established) is given in the Official Circulars, of which five numbers were printed during the year.

The Scientific, Philological, Historical, and Metaphysical Associations, composed of the professors and advanced students, have met frequently during the year, for the presentation and discussion of papers or oral communications, and abstracts of the more important papers read at their sessions have been printed.

GRADUATES OF THE YEAR.

The number of undergraduates, who have come forward to the baccalaureate degree, during the year, has been twelve, making the whole number of Bachelors of Arts, here created in three years, thirty-one.

The names of those graduating in 1880–81 are as follows:

WILLIAM W. BADEN, Baltimore.
HENRY J. BOWDOIN, Baltimore.
JOHN W. BROWN, Govanstown.
DAVID T. DAY, Baltimore.
WILLIAM H. HOWELL, Baltimore.
JOHN JOHNSON, Owings Mills.
JAMES E. KEELER, Mayport, Fla.
EDWIN G. RICHARDSON, Baltimore.
ADONIRAM J. ROBINSON, Baltimore.
HENRY ROLANDO, Baltimore.
LEE SALE, Louisville, Ky.
MACTIER WARFIELD, Baltimore.

Nine candidates, who had presented the requisite theses and also passed the examinations successfully, were made Doctors of Philosophy. The whole number of persons admitted among us to this second degree is twenty-four. Nearly all of these are looking forward to the profession of teaching as their career in life; nineteen of them have already

received appointments in colleges and other educational establishments.

The names of the Doctors of Philosophy (1880–81) and the titles of their theses are as follows :—

LOUIS BEVIER, of Marbletown, N. Y., A. B., Rutgers College, 1878. His principal study was Greek, the subsidiary, Sanskrit, (in which he was examined by Professor C. R. Lanman, now of Harvard University), and Latin. He submitted a thesis "On the Genuineness of the First Antiphontean Oration."

R. DORSEY COALE, of Baltimore. His principal study was Chemistry, the subordinate, Physics. His thesis, "On Sulphamine- and Sulphoisophthalic Acids," has been printed, in modified form, in the *American Chemical Journal*, (vol. iii, no. 3.)

EDWARD A. FAY, of Washington, D. C., A. B., University of Michigan, 1862, and A. M., 1865. His principal study was the Romance Languages, the subordinate, Latin. His thesis, "On the Conditional Relations in the Romance Languages," was submitted to Professor Austin Stickney, of New York, formerly of Trinity College, Hartford.

LAWRENCE B. FLETCHER, of Marlboro, N. Y., A. B., Columbia College, 1877, and A. M., 1880; (Fellow of Columbia College, 1877–80.) His principal study was Physics, the subordinate, Chemistry. He submitted a thesis "On the Determination of the Mechanical Equivalent of Heat by Electrical Means," which was referred to Professor John Trowbridge, of Harvard University, and will shortly be printed.

SAMUEL GARNER, of Annapolis, A. B., St. John's College, 1871. His principal study was the Romance Languages, the subordinate, German. He submitted a thesis on "The Gerundial Construction in the Romance Languages," which was examined by Professor F. Stengel, of Columbia College.

EDWARD M. HARTWELL, of Littleton, Mass., A. B., Amherst College, 1873, and A. M., 1876. His principal study was Animal Physiology, the subordinate, Animal Histology and Animal Morphology. He submitted a thesis, "Notes on some points in the Anatomy and Physiology of the Slider Terrapin, (*Pseudemys rugosa*)," which will be printed in a forthcoming number of the *Studies from the Biological Laboratory*.

WILLIAM T. SEDGWICK, of Farmington, Conn., Ph. B., Yale College, 1877. His principal study was Animal Physiology, the subordinate, Animal Morphology and Vegetable Physiology. His thesis, on "The Influence of Quinine on the Reflex Excitability of the Spinal Cord," has been printed in *The Journal of Physiology*, (vol. iii, no. 1).

CHRISTIAN SIHLER, of Cleveland, Ohio, Concordia College, 1866; M. D., University of Michigan, 1871. His principal study was Animal Physiology, the subordinate, Animal Morphology and Chemistry. His

thesis on "The Formation of Bone and Tooth," was submitted to Dr. George A. Otis, of the U. S. Surgeon General's Office, Washington.

EDMUND B. WILSON, of Geneva, Ill., Ph. B., Yale College, 1878. His principal study was Animal Morphology, the subordinate, Animal Histology, and Animal Physiology. His thesis, on "The Origin and Significance of the Metamorphosis of Actinotrocha," has been printed in the *Quarterly Journal of Microscopical Science*, (April, 1881).

Two social assemblies were held in connection with the bestowal of degrees, the first on Commemoration Day, February 22d, 1881, and the second at the close of the year, June 6th, 1881. There was also a gathering of the officers and students, as heretofore, at the opening of the academic year.

On the 12th of February, the university received a visit from the President of the United States, RUTHERFORD B. HAYES, who was escorted to the Hopkins Hospital by some of the Trustees, and afterwards to the halls of the university. As a token of respect for his official and personal character the university conferred upon him the honorary degree of Doctor of Laws.

The university extended its hospitality to the American Library Association, Justin Winsor, Esq., of Harvard College, President, on the 11th of February, 1881. The Medical and Chirurgical Faculty of Maryland held its annual meeting in Hopkins Hall,—and in the same place, preliminary meetings were held for organizing a Civil Service Reform Association, and a union of local charitable societies under the name of the Charity Organization Society of Baltimore.

Personal Changes.

Death has deprived the Board of two of the members originally selected by the founder of the university to administer his trust. Mr. Galloway Cheston, who had been the President of the Board from its organization, died on the ninth of March, 1881, in his seventy-fifth year. During all his mature life he had been a merchant of Baltimore, filling with credit from time to time positions of financial responsibility, but shrinking with native modesty from other conspicuous stations to which the respect of his fellow citizens would have called him. He took an active interest in the university affairs, and was rarely absent from the meetings of the Trustees, giving his steady influence in favor of maintaining the highest ideal of university education. Soon afterwards, on the twenty-eighth of May, 1881, Mr. William Hopkins, a cousin of the founder, and the Secretary of the Board, was removed by death, at the age of sixty-seven years. He had been engaged during most of his life in business, and had won the confidence and respect of those who knew him by his integrity and adherence to what he considered right.

When the work of the session was concluded, Mr. Sidney Lanier,* who had been for two years

*A commemorative address by Dr. Wm. Hand Browne, delivered in Hopkins Hall, October 22, has been printed.

Lecturer on English Literature, sought to recruit his failing strength by a resort to the mountainous regions of North Carolina,—but a long continued disease had already made such progress that the fatal termination could not be postponed, and he died September 7, 1881, in the fortieth year of his age. He was favorably known in the literary world by his poems and other writings, and was greatly beloved by a circle of admiring friends.

The number of Associates has been increased by the appointment in Biology, of Henry Sewall, Ph. D., formerly an assistant here, and recently a student in the university of Leipsic; in Sanskrit, of Maurice Bloomfield, Ph. D., who continued the study of Comparative Philology at Leipsic and Berlin, after graduating here two years ago; in Mathematics, of Thomas Craig, Ph. D., who has been connected with this university since its opening and has also, of late, been an adjunct of the United States Coast and Geodetic Survey; in Biology, of William T. Sedgwick, Ph. D., and in English, of Henry Wood, Ph. D. (Leipsic), recently one of the teachers in the Friends' School, Providence.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

September, 1881.

APPENDIX.

A.

Academic Staff, 1876-82.*

PRESIDENT.

	Appointed.
DANIEL C. GILMAN, ...	*December* 30, 1874.

PROFESSORS.

		Appointed.
BASIL L. GILDERSLEEVE,	*Greek*, . . .	1876.
J. J. SYLVESTER, . .	*Mathematics*, . . .	1876.
IRA REMSEN, . .	*Chemistry*, . . .	1876.
HENRY A. ROWLAND, .	*Physics*, ...	1876.
H. NEWELL MARTIN, .	*Biology*, ...	1876.
CHARLES D. MORRIS, .	*Classics*, ...	1876.

ASSOCIATES.

		Years of Service.
JOHN M. CROSS, . .	*Greek*, ...	1876–1881.
PHILIP R. UHLER, . .	*Natural History*, . .	1876–
AUSTIN SCOTT, . .	*History*, ...	1876–
A. MARSHALL ELLIOTT, .	*Romance Philology*, .	1876–
THOMAS C. MURRAY, .	*Shemitic*, ...	1876–1879.
HERMAN C. G. BRANDT, .	*German*, ...	1876–
WILLIAM K. BROOKS, .	*Biology*, ...	1876–
HARMON N. MORSE, . .	*Chemistry*, . . .	1876–
ROBERT RIDGWAY, . .	*Natural History*, . .	1876–1877.
WILLIAM E. STORY, . .	*Mathematics*, . . .	1876–
ARTHUR W. TYLER, . .	*Librarian*, . . .	1876–1878.
CHARLES S. HASTINGS, .	*Physics*, ...	1876–
CHARLES R. LANMAN, .	*Sanskrit*, . . .	1877–1880.
HERBERT B. ADAMS, .	*History*, ...	1878–
ALBERT S. COOK, . .	*English*, ...	1879–1881.
MINTON WARREN, . .	*Latin*, ...	1879–
WILLIAM HAND BROWNE,	*Librarian*, . . .	1879–

*The names in each group are arranged in the order of appointment.

		Years of Service.
HENRY SEWALL,	*Biology*,	1880–
THOMAS CRAIG,	*Mathematics*,	1880–
MAURICE BLOOMFIELD,	*Sanskrit*,	1881–
WILLIAM T. SEDGWICK,	*Biology*,	1881–
HENRY WOOD,	*English*,	1881–

LECTURERS.

SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*	1877.
FRANCIS J. CHILD,	*Early English, etc.*,	1877–1878.
THOMAS M. COOLEY,	*Law*,	1877–1879.
JULIUS E. HILGARD,	*Geodetic Surveys*,	1877.
JAMES RUSSELL LOWELL,	*Romance Literature*,	1877.
JOHN W. MALLET,	*Technological Chemistry*,	1877–1878.
FRANCIS A. WALKER,	*Political Economy*,	1877–1878.
WILLIAM D. WHITNEY,	*Comparative Philology*,	1877.
WILLIAM F. ALLEN,	*History*,	1878.
WILLIAM JAMES,	*Psychology*,	1878.
GEORGE S. MORRIS,	*Philosophy*,	1878–
J. LEWIS DIMAN,	*History*,	1879.
H. VON HOLST,	*History*,	1879.
WILLIAM G. FARLOW,	*Botany*,	1879.
J. WILLARD GIBBS,	*Theoretical Mechanics*,	1879.
SIDNEY LANIER,	*English Literature*,	1879–1881.
CHARLES S. PEIRCE,	*Logic*,	1879–
JOHN TROWBRIDGE,	*Physics*,	1880.
A. GRAHAM BELL,	*Phonology*,	1881.
S. P. LANGLEY,	*Physics*,	1881.
JOHN MCCRADY,	*Biology*,	1881.
JAMES BRYCE,	*Political Science*,	1881.
EDWARD A. FREEMAN,	*History*,	1881.
JOHN J. KNOX,	*Banking*,	1881.
ARTHUR CAYLEY,	*Mathematics*,	1882.
WILLIAM W. GOODWIN,	*Greek*,	1882.
G. STANLEY HALL,	*Psychology*,	1882.
SIMON NEWCOMB,	*Taxation*,	1882.
RICHARD M. VENABLE,	*Constitutional Law*,	1882.

INSTRUCTORS AND ASSISTANTS.

		Years of Service.
HENRY SEWALL,	*Biology*,	1876–1878.
SAMUEL F. CLARKE,	*Biology*,	1879–1881.
FABIAN FRANKLIN,	*Mathematics*,	1879–
LYMAN B. HALL,	*Chemistry*,	1879–1880.
CHRISTIAN SIHLER,	*Biology*,	1879–1880.
HENRY C. ADAMS,	*Political Economy*,	1879–1881.
THOMAS CRAIG,	*Mathematics*,	1879–1880.
CHAS. L. WOODWORTH,	*Elocution*,	1879–
WILLIAM T. SEDGWICK,	*Biology*,	1880–1881.
EDWIN H. HALL,	*Physics*,	1880–1881.
GEORGE H. STOCKBRIDGE,	*Latin and German*,	1880–1881.
PHILIPPE B. MARCOU,	*French*,	1880–
HUGH NEWELL,	*Drawing*,	1880–
R. DORSEY COALE,	*Chemistry*,	1881–
RICHARD T. ELY,	*Political Economy*,	1881–
LAWRENCE B. FLETCHER,	*Physics*,	1881.
GEORGE F. NICOLASSEN,	*Greek and Latin*,	1881–
BENJAMIN E. SMITH,	*Philosophy*,	1881–
EDMUND B. WILSON,	*Biology*,	1881–

B.

Roll of Fellows.*

The following list gives the names of all persons who have been selected by the authorities and appointed to Fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the Fellowships, their names are given to exhibit fully the working of this system of appointment.

Where no location is stated, the Johns Hopkins University is to be understood.

1. HENRY CARTER ADAMS, Ph. D., Non-Resident Professor at Cornell University, 1881–82.

From Waterloo, Iowa; Denmark Academy, Iowa, 1870; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; Lecturer upon Political Economy, at Cornell University, 1879–80, at Johns Hopkins University, 1879–81, at University of Michigan, 1880–82; (*Political Science*, 1876–79.)

History of Taxation in the United States, (Graduating Thesis, J. H. U., 1878), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789–1816. (*Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen*, 1879.)
Cooperation. (*Am. Soc. Sc. Assoc.*, 1878.)
Historical Position of Socialism in the Development of Political Economy. (*Penn. Monthly*, 1879.)
Payment of Public Debts. (*International Review, September*, 1881.)
Democracy. (*New Englander, November*, 1881.)
Modern Public Debts. (*International Review, March*, 1881.)
Irish Land Question. (*New Englander, February*, 1881.)
Outline of Lectures upon Political Economy. (*Baltimore*, 1881.)

2. HERBERT BAXTER ADAMS, Ph. D., Associate in History.

From Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872–73; Student of History and Political Science at Heidelberg and Berlin, 1873–76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878–81; (*History*, 1876–78.)

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Historical Society, Fund Publication, No.* 11, 1877.)
The Germanic Origin of New England Towns. (*Harvard University Bulletin, June*, 1881.)
Salem Commons and Commoners, or the Economic Beginnings of Massachusetts. (*Bulletin of the Essex Institute, Aug.* 30, 1881. *To be published in full in the Historical Collections of the Institute.*)
Tithingmen. (*American Antiquarian Society, Proceedings, Vol. I, Part* 3.)
Constables. (*New England Historic-Genealogical Society, Proceedings, April*, 1882.)

3. WILLIAM KEITH BROOKS, Ph. D., Associate in Biology, and Director of Chesapeake Zoölogical Laboratory.

From Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874–75; (*Biology*, 1876; *appointed Associate before entering on the Fellowship.*)

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (*Proc. Amer. Assoc.*, 1874.)
Embryology of the Fresh-Water Mussel. (*Proc. Amer. Assoc.*, 1875.)
Embryology of Salpa. (*Proc. Boston. Soc. Nat. Hist.*, 1875; *Archiv. f. Naturgeschichte*, 1876.)
The Affinity of the Mollusca and the Molluscoida. (*Proc. Boston Soc. Nat. Hist.*, 1875; *Ann. & Mag. Nat. Hist.*, 1876.)

*See statement of System of Fellowships on page 46.

The Development of Salpa. (*Bull. Mus. Comp. Zoöl., Cambridge, No.* 14.)
A Remarkable Life-History. (*Am. Nat., Nov.*, 1876.)
A Provisional Hypothesis of Pangenesis. (*Am. Nat., March*, 1877.)
Parthenogenesis in Vertebrates and Molluscs. (*Am. Nat., Oct.*, 1877.)
Preliminary Observations upon the Development of the Marine Prosobranchiate Gasteropods. (*Studies from the Biol. Lab., J. H. U.*, 1879.)
The Development of Lingula and the Systematic Position of the Branchiopods. (*Scientific Results, Chesapeake Zoöl. Lab.*, 1879.)
Du développement de la Lingula et de la position Zoölogique des Branchiopods. (*Arch. f. Zool. exp.*, 1881.
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Embryology of the Fresh-Water Pulmonates. (*Studies from the Biol. Lab., J. H. U.*, 1879.)
Abstract of Observations on the Development of the American Oyster. (*Zoöl. Anzeiger*, 1879.)
The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (*Am. Jour. of Science*, 1879.)
The Development of the American Oyster. (*Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U.*, 1880.)
The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (*Studies from the Biol Lab., J. H. U.*, 1880; 10 *plates.*)
The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (*Am. Jour. of Science*, 1880.)
The Rhythmical Character of Segmentation. (*Am. Jour. of Science*, 1880.)
Budding in Free Medusae. (*Am. Nat., Sept.*, 1880.)
Embryology and Metamorphosis of the Sergestidae. (*Zoöl. Anzeiger, Nov.*, 1880.)
The Young of the Crustacean Lucifer, A Nauplius. (*Am. Nat., Nov.*, 1880.)
The Development of the Squid. (*Anniv. Mem. Boston Soc. Nat. Hist., March*, 1881; 3 *plates.*)
Alternation of Periods of Rest with Periods of Activity in the Segmenting Eggs of Vertebrates. (*Studies from the Biol. Lab., J. H. U.*, 1881; 1 *plate.*)
The First Zoea of Porcellana. (With E. B. Wilson; *Studies from the Biol. Lab., J. H. U.*, 1881; 2 *plates.*)
List of the Medusae of Beaufort, N. C. (*Studies from the Biol. Lab., J. H. U.*, 1882.)
Origin of the Eggs of Salpa. (*Studies from the Biol. Lab., J. H. U.*, 1882; 1 *plate.*)
Lucifer: A Study in Morphology. (*Proc. Royal Soc., London*, 1881.)
The Development of Lucifer. (*Phil. Trans. Royal Soc., London*, 1882; 11 *plates.*)
Handbook of Vertebrate Zoölogy. (*Boston, Cassino*, 1882.)
Chamisso and the Discovery of Alternation of Generations. (*Zoöl. Anzeiger; in press.*)
The Development of the Digestive Tract in Molluscs. (*Proc. Boston Soc. Nat. Hist.*, 1879.)

4. Thomas Craig, Ph, D., Associate in Applied Mathematics.

From Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878; Lecturer on Mathematics, 1879–81; U. S. Coast & Geodetic Survey, 1879–81; (*Mathematics*, 1876–78; *Physics*, 1878–79.)

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (*Graduating Thesis, J. H. U.*, 1878.)
Motion of a Point upon the Surface of an Ellipsoid. (*Am. Jour. of Math.*, 1878.)
Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng. Mag.*, 1879.)
Wave and Vortex Motion. (*N. Y., Van Nostrand*, 1879.)
Motion of a Solid in a Fluid. (*N. Y., Van Nostrand*, 1879.)
Motion of a Solid in a Fluid. (*Am. Jour. of Math.*, 1879.)
General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst.*, 1879.)
Treatise on the Mathematical Theory of Projections. (*U. S. Coast Survey*, 1879.)
Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math.*, 1879.)
Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math.*, 1879.)
Motion of Viscous Fluids. (*Jour. of Franklin Inst.*, 1880.)
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Orthomorphic Projection of the Ellipsoid upon a Sphere. (*Am. Jour. of Math.*, 1880.)
On Certain Possible Cases of Steady Motion in a Viscous Fluid. (*Am. Jour. of Math.*, 1881.)
Distortion of an Elastic Sphere. (*Jour. für die reine und angewandte Mathematik*, 1881.)
On Certain Partial Differential Equations analogous to those of Hydrodynamics. (*Am. Acad. of Science*, 1881.)
Note on Abel's Theorem. (*London Math. Soc., Proc.*, 1881.)

5. Joshua Walker Gore, Assistant Professor of Mathematics at the University of Virginia.

From Frederick County, Va.; C. E., University of Virginia, 1875; Professor of Natural Science, Southwestern Baptist University, 1878–81; (*Mathematics*, 1876–78.)

6. GEORGE BRUCE HALSTED, Ph. D., Instructor in Post-Graduate Mathematics at Princeton College.

From New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875–76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; (*Mathematics*, 1876–78.)

Basis for a Dual Logic. (*Graduating Thesis, J. H. U.*, 1879.)
Spencer's Classification of the Abstract Sciences. (*Pop. Sc. Mon.*, 1877.)
The New Ideas about Space. (*Pop. Sc. Mon.*, 1877.)
Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math.*, 1878–79.)
Note on the First English Euclid. (*Am. Jour. of Math.*, 1879.)
Historical Sketch of Exact Rectilinear Motion. (*Van Nostrand's Eng. Mag.*, 1878.)
Mechanical Conversion of Motion. (*Van Nostrand's Eng. Mag.*, 1878; reprinted in "*World of Science.*" *London.*)
Jevons's Criticism of Boole's Logic. (*Mind*, 1878.)
Boole's Logical Method. (*Jour. of Spec. Philos.*, 1878.)
Statement and Reduction of Syllogism. (*Jour. of Spec. Philos.*, 1878.)
Algorithmic Division in Logic. (*Jour. of Spec. Philos.*, 1879.)
Modern Mathematicians as Educators. (*Nassau Lit. Mag.*, XXXII, 2.)
Is Formal Logic a Branch of Mathematics. (*Nassau Lit. Mag.*, XXXII, 3.)
Algebras, Spaces, Logics. (*Pop. Sc. Mon.*, 1880.)
Mensuration: Metrical Geometry. (*Boston Ginn, Heath & Co.*, 1881.)

7. EDWARD HART, Ph. D., Assistant Professor of Chemistry at Lafayette College.

From Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; (*Chemistry*, 1876–78.)

Nitrosulphobenzoic Acids and their Derivatives. (*Graduating Thesis, J. H. U.*, 1879; *Am. Chem. Jour.*, 1879.)
Volumetric Estimation of Sulphuric Acid. (*Am. Chemist*, VI, 284.)
Volumetric Estimation of Iron. (*Chem. News*, XXXIV, 65.)
Ueber Isomere Sulfosaüren aus Paranitrotoluene. (*Ber. d. deut. chem. Ges.*, X, 1046; *Notes from Chem. Lab., J. H. U.*, 1877.)
Handbook of Volumetric Analysis. (*N. Y., Wiley*, 1878.)
Stopcock of Easy Construction. (*Am. Chemist*, 1879.)
New Experiment for Showing the Gas in the Interior of a Flame. (*Am. Chemist, Dec.*, 1874.)
An Analysis of a Specimen of Silver-Gray or Glazy Iron. (*Trans. Amer. Inst. Min. Eng., Vol.* 5.)

8. DANIEL WEBSTER HERING, Professor of Mathematics at Western Maryland College, Westminster.

From Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873–74; C. E., Yale, 1878; Assistant Engineer, Baltimore and Cumberland Valley Railroad, 1878–80; (*Engineering*, 1876–78.)

9. MALVERN WELLS ILES, Ph. D., Chemist, Leadville, Colorado.

From Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1877; (*Chemistry*, 1876–78.)

A New Qualitative Reaction for Boracic Acid. (*Am. Chemist*, 1876.)
On the Action of Ozone upon Milk. (*Sc. Amer.*, 1877.)
On the Oxidation of Sulpho-Acids derived from Metaxylene. (*Notes from Chem. Lab., J. H. U.*, 1877.)
On the Oxidation of Xylenesulphonic Acids. (With Prof. Remsen; *Notes from Chem. Lab., J. H. U.*, 1877–78; *Am. Chem. Jour.*, 1879.)
A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U.*, 1878.)
Chloro-Bromide of Lead. (*Am. Chem. Jour.*, 1881.)
A New Manganese Mineral. (*Am. Chem. Jour.*, 1882.)

10. William White Jacques, Ph. D., Electrician of the American Bell Telephone Co., Boston, Mass.

From Newburyport, Mass.; S. B., Mass. Institute of Technology, 1876; Ph. D., Johns Hopkins, 1879; (*Physics*, 1876–79.)

Light Transmitted by One or More Plates of Glass. (*Proc. Am. Acad.*, 1875.)
Answer to M. Jamin's Objections to Ampère's Theory. (*Proc. Am. Acad.*, 1875.)
Diffraction of Sound. (*Proc. Am. Acad.*, 1876.)
An Experimental Proof of the Law of Inverse Squares for Sound. (*Proc. Am. Acad.*, 1876.)
Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. of Franklin Inst.*, 1878.)
Velocity of Very Loud Sounds. (*Am. Jour. of Science*, 1879.)
Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (*Am. Jour. of Science*, 1879.)
Distribution of Heat in the Spectra of Various Sources of Radiation. (*Graduating Thesis, J. H. U.*, 1879; *Proc., Am. Acad.*, 1879.)

11. Charles Rockwell Lanman, Ph. D., Professor of Sanskrit at Harvard University.

From Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873–74, Tubingen, 1874–75, Leipzig, 1875–76; Secretary and Curator of the American Philological Association, 1879–81; Associate in Sanskrit, 1877–80; (*Sanskrit*, 1876–77.)

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (*Leipzig*, 1873–75.)
Compendium of Sanskrit Paradigms. (1876.)
A Conjectural Emendation of Rig-Veda i. 30. 11. (*Am. Or. Soc. Proc.*, 1877.)
On Tentative Linguistic Forms. (*Am. Or. Soc. Proc.*, 1878.)
Noun-Inflection in the Veda. (*Am. Or. Soc. Jour., Vol.* X., *pp.* 325–601.)
On Cataleetic Vedic Verses of Seven Syllables. (*Am. Or. Soc. Proc.*, 1880.)
A Sanskrit Reader, with Dictionary and Notes. Parts I (Reader) and II (Dictionary) (*In press.*)

12. David McGregor Means, New York City.

From Andover, Mass.; A. B., Yale, 1868; Professor of Political and Mental Science in Middlebury College, Vermont, 1877–80; (*Political Science*, 1876–77.)

The Pardoning Power. (*New Englander*, 1875.)
The Trouble with the Caucus. (*New Englander*, 1875.)
Are all Criminals Insane? (*New Englander*, 1876.)
Chinese Immigration and Political Economy. (*New Englander*, 1877.)
Aristotle: His Theology (*Bibliotheca Sacra*, 1877); His Theory of Ideas (*ib.*, 1878); His Ethics (*ib.*, 1879.)
Nominalism. (*Mind*, 1879.)
Taxation of Mortgages. (*New Englander*, 1880.)
Data of Ethics. (*Bibliotheca Sacra*, 1880.)
H. Spencer's Ethics. (*Mind*, 1880.)

13. Harmon Northrop Morse, Ph. D., Associate in Chemistry.

From Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875–76; (*Chemistry*, 1876; *appointed Associate before entering upon the Fellowship.*)

Benzoylamidophenols. (*Ber. d. deut. chem. Ges.*, 1874.)
Ueber Einige Derivate des Ortho-und Paramidophenols. (*Inaugural Dissertation, Göttingen*, 1875.)
On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (*Notes from Chem. Lab., J. H. U.*, 1877.)
On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (*Notes from Chem. Lab., J. H. U.*, 1877.)
On the Determination of Barium as Chromate. (*Am. Chem. Jour.*, 1880.)
Determinations of Chromium in Chrome Iron Ore. (With W. C. Day; *Am. Chem. Jour.*, 1881.)

14. WALTER HINES PAGE, Cary, N. C.

From Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875-76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878-79; (*Greek*, 1876-78.)

An Old Southern Borough. (*Atlantic Monthly, May*, 1881.)
The Southern Educational Problem. (*International Review, October*, 1881.)

15. P. PORTER POINIER.

From Newark, N. J.; M. E., Stevens Inst. of Technology, 1874; (*Physics*, 1876; *died without entering upon the Fellowship, June*, 1876, *aged* 23 *years.*)

Formulæ for the Apparent Specific Heat of Saturated Vapors. (*Jour. of Franklin Inst.*, 1875.)

16. ERASMUS DARWIN PRESTON, U. S. Coast and Geodetic Survey, now stationed in Baltimore.

From Spruce Grove, Pa.; B. C. E., Cornell, 1875, and C. E., 1880; Assistant Engineer, Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875-76; Student at the Ecole des Ponts et Chaussées, Paris, 1878-79; (*Engineering*, 1876-78.)

17. HENRY JOSEPH RICE, Professor of Natural Sciences at Michigan Military Academy, Orchard Lake, Michigan.

From Cazenovia, N. Y.; B. S., Cornell, 1876, and M. S., 1880; Sc. D., Syracuse, 1881; Student of Biology, University of France, Paris, 1878; Assistant U. S. Fish Commission, 1879; (*Biology*, 1876-78.)

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, Osmerus eperlanus. (*Md. Fish Commission*, 1878.)
Notes upon the Development of the Shad, Alosa sapidissima. (*Md. Fish Commission*, 1878.)
Observations upon the Habits, Structure and Development of Amphioxus lanceolatus. (*Am. Nat.*, 1880; *trans. in Journal de Micrographie, Paris*, 1880.)

18. JOSIAH ROYCE, Ph. D., Instructor in English Literature at the University of California.

From Oakland, Cal.; A. B., University of California, 1875; Ph. D., Johns Hopkins, 1878; (*Philosophy*, 1876-78.)

Interdependence of the Principles of Human Knowledge. (*Graduating Thesis, J. H. U.*, 1878.)
Schiller's Ethical Studies. (*Jour. of Spec. Philos.*, 1878.)
Shelley and the Revolution. (*Californian*, 1880.)
Nature of Voluntary Progress. (*Berkeley Quarterly*, 1880.)
Before and Since Kant. (*Berkeley Quarterly, April*, 1881.)
George Eliot as a Religious Teacher. (*Californian, April*, 1881.)
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Primer of Logical Analysis for Composition Students. (*San Francisco, Bancroft*, 1881.)
Mind and Reality. (*Mind*, 1882.)
The Decay of Earnestness. (*Californian*, 1881.)
Doubting and Working. (*Californian*, 1881.)
How Beliefs are Made. (*Californian*, 1882.)
Kant's Relation to Modern Philosophic Progress. (*Jour. of Spec. Philos., Oct.*, 1881.)

19. ERNEST GOTTLIEB SIHLER, Ph. D., Classical Instructor, New York City.

From Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classical Philology at Berlin and Leipsic, 1872–75; Ph. D., Johns Hopkins, 1878; (*Greek*, 1876–79.)

Plato's Use of Metaphor and Comparison. (*Graduating Thesis, J. H. U.*, 1878.)
Herodotus, Æschylus, and the Battle of Salamis. (*Trans., Am. Philol. Assoc.*, 1877.)
The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Proc., Am. Philol. Assoc.*, 1879.)
Character and Career of Tiberius. (*Penn Monthly*, 1880.)
Virgil and Plato. (*Trans., Am. Philol. Assoc.*, 1880.)
Plato: Protagoras. *Edited* with an introduction and notes. (*New York, Harper*, 1881.)
The Use of Abstract Verbal Nouns in -σις in Thucydides. (*Trans., Am. Philol. Assoc.*, 1881.)
Homer and Strabo. (*Proc., Am. Philol. Assoc.*, 1881.)

20. FREDERICK BOYD VAN VORST, Attorney at Law, New York City.

From New York City; A. B., Princeton, 1875; Fellow in Metaphysics in Princeton College, 1875–76; (*Ethics and Metaphysics*, 1876–77.)

21. JOHN HENRY WHEELER, Ph. D., Professor of Latin at Bowdoin College.

From Woburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow of Harvard University, 1877–80; Ph. D., Bonn, 1879; Tutor in Greek and Latin at Harvard University, 1880–81; (*Philology*, 1876–77.)

De Alcestidis et Hippolyti Euripidearum Interpolationibus. (*Inaugural Dissertation, Bonn*, 1879.)

22. SAMUEL FESSENDEN CLARKE, Ph. D., Professor of Natural History at Williams College.

From Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874–75; Assistant in Zoölogy in Sheffield Scientific School, 1874–76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; Assistant in the Biological Laboratory, 1879–80; (*Biology*, 1876–79.)

New and Rare Species of Hydroids from the New England Coast. (*Conn. Acad.*, 1875.)
New Hydroids of the Pacific Coast, South of Vancouver Island. (*Conn. Acad.*, 1876.)
Hydroids of Alaska. (*Acad. Nat. Sc., Phila.*, 1876; *Smithsonian Institution*, 1876.)
Hydroids of the Gulf Stream and Gulf of Mexico. (*Mus. Comp. Zoöl, Camb., Mass.*, 1879.)
Development of Amblystoma punctatum, Baird. (*Graduating Thesis, J. H. U.*, 1879; *Studies from the Biol. Lab., J. H. U.*, 1879.)
Development of a Double-headed Vertebrate. (*Boston Soc. Nat. Hist*, 1880.)
The Early Development of the Wolffian Body in Amblystoma punctatum. (*Studies from the Biol. Lab., J. H. U.*, 1881.)
New Hydroids from Chesapeake Bay. (*Boston Soc. Nat. Hist.*, 1882.)

23. LYMAN BEECHER HALL., Ph. D., Professor of Chemistry and Physics at Haverford College, Montgomery County, Pa.

From New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Assistant in Chemical Laboratory, 1879–80; (*Chemistry*, 1877–79.)

Ueber Orthonitrosalicysäure und einige Abkömmlinge derselben. (*Inaugural Dissertation, Göttingen*, 1875.)
On the Oxidation of Mesitylene-Sulphonic Acid. (*Notes from Chem. Lab., J. H. U.*, 1877; *Ber. d. deut. chem. Ges.*, X.)
On the Oxidation of Substitution Products of Mesitylene. (*Notes from Chem. Lab., J. H. U.*, 1878.)
Ueber Oxidationsprodukte aus Cymosulfamid. (*Ber. d. deut. chem. Ges.*, XII.)
On the Oxidation of Substitution Products of Aromatic Hydrocarbons. (With Professor Remsen; *Am. Chem. Jour.*, 1880.)

24. ALEXANDER DUNCAN SAVAGE, New York City.

From Pass Christian, Miss.; B. Litt., University of Virginia, 1870; First Assistant Director of the Metropolitan Museum of Art, New York, 1879-81; (*Greek*, 1876-79.)

The "Oath of Rhadamanthus." (*Proc., Am. Philol. Assoc.*, 1878.)
Potteries of the Cesnola Collection. (*Metropolitan Museum of Art, Handbook No. 2, New York*, 1880.)
Sculptures of the Cesnola Collection of Cypriote Antiquities. (*Metropolitan Museum of Art. Handbook No. 3, New York*, 1880.)
A Short Guide to the Cesnola Collection of Cypriote Antiquities. (*Metropolitan Museum of Art, New York*, 1880.)

25. FABIAN FRANKLIN, Ph. D., Assistant in Mathematics.

From Baltimore; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870-71; City Surveyor's Office, Baltimore, 1871-77; Graduate Student of Mathematics, 1876-77; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1877-79.)

Bipunctual Coördinates. (*Graduating Thesis, J. H. U.*, 1880; *Am. Jour. of Math.*, 1878.)
Notes on Partitions of Numbers, etc. (*Am. Jour. of Math.*, 1878; 1879; 1880.)
On the Calculation of the Generating Functions and Tables of Groundforms for Binary Quantics. (*Am. Jour. of Math.*, 1880.)
Sur le Développement du Produit Infini $(1-x)(1-x^2)(1-x^3)(1-x^4)\ldots$. (*Comptes Rendus*, XCII, *p.* 448, 1880.)

26. CHRISTIAN SIHLER, Ph. D., Physician, Cleveland, Ohio.

From Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; Assistant in the Biological Laboratory, 1879-80; Ph. D., Johns Hopkins, 1881; (*Biology*, 1877-79.)

On the so-called Heat-Dyspnœa. (*Jour. of Physiol.*, 1879.)
Some Further Observations on Heat-Dyspnœa. (*Jour. of Physiol.*, 1880; *Studies from the Biol. Lab., J. H. U.*, 1881.)
Notes on the Formation of Dentine and of Osseous Tissue. (*Graduating Thesis, J. H. U.*, 1881; *Studies from the Biol. Lab., J. H. U.*, 1881.)

27. FRANCIS GREENLEAF ALLINSON, Ph. D., Assistant Professor of Greek and Latin at Haverford College.

From Burlington, N. J.; A. B., Haverford, 1876, and A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878; Ph. D., Johns Hopkins, 1880; (*Greek and Sanskrit*, 1877-80.)

On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus. (*Graduating Thesis, J. H. U.*, 1880.)
Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Isocrates, and Demosthenes. (*Quaker Alumnus, Phila.*, 1878.)
A Proposed Redistribution of Parts in the Parodos of the Vespæ of Aristophanes. (*Am. Jour. of Philol.*, 1880.)

28. MAURICE BLOOMFIELD, Ph. D., Associate in Sanskrit.

From Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; Student of Philology at Berlin and Leipsic, 1879-81; (*Sanskrit and Greek*, 1878-79.)

Noun-Formation of Rig-Veda. (*Graduating Thesis, J. H. U.*, 1879.)
The Ablaut of Greek Roots which show Variation between *E* and *O*. (*Am. Jour. of Philol.*, 1880.)
Das Grhyasamgrahaparicista des Gobhilaputra. (*Zeitsch. d. deut. morgenländ. Ges., Vol.* XXXV.)
On Diphthongal *E* and *O* in Sanskrit. (*Am. Oriental Soc., Proc.*, 1881.)
Final *AS* before Sonants in Sanskrit. (*Am. Jour. of Philol.*, 1882.)

29. CONSTANTINE FAHLBERG, Ph. D., Chemist, Gray's Ferry Chemical Works, Philadelphia.

From Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874-75; Analytical and Consulting Chemist, New York City, 1875-76; Assistant in Dr. Halse's Technological Laboratory, London, 1876-77; Chemist of the Colonial Company, London and Demerara (South America), 1877-78; Graduate Student of Chemistry, 1878; (*Chemistry*, 1878-80.)

Determination of Calcium Monosulphide in Boneblack. (*Zeitsch f. analyt. Chem.*, 1871.)
On Oxyacetic Acid. (*Dissertation, Leipsic*, 1873, *Kolbe's Jour.*, 1873.)
New Method for the Volumetric Estimation of Zinc. (*Zeitsch. f. analyt. Chem.*, 1875.)
Description of the Manufacture of Cane Sugar in Demerara. (*Royal Gazette*, 1877.)
Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (*U. S. Patent Office*, 1878.)
A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U.*, 1878.)
On the Oxidation of Toluenorthosulphamide. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1878; *Am. Chem. Jour.*, 1880.)
On the Liquid Toluenesulphochloride. (*Am. Chem. Jour.*, 1879.)
Reply to Delachanal and Mermet. (*Ber. d. deut. chem. Ges.*, 1879.)
On Toluenedisulphonic Acid and its Derivatives. (*Am. Chem. Jour.*, 1880.)

30. EDWIN HERBERT HALL, Ph. D., Instructor in Physics at Harvard University.

From Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics, 1877-78; Ph. D., Johns Hopkins, 1880; Assistant in Physical Laboratory, 1880-81; (*Physics*, 1878-80.)

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math.*, 1879.)
On Boltzmann's Method of Determining the Velocity of an Electric Current. (*Am. Jour. of Science*, 1880.)
On the New Action of Magnetism on a Permanent Electric Current. (*Graduating Thesis, J. H. U.*, 1880; *Am. Jour. of Science*, 1880.)
The "Rotational Coefficient" in Nickel and Cobalt. (*Phil. Mag., Sept.*, 1881.)

31. EDWARD COLES HARDING, Lottsburg, Va.

From Northumberland County, Va.; A. M., University of Virginia, 1876; Law Department, University of Virginia, 1876-77; Classical Instructor, Baltimore, 1877-78; Professor of Greek, University of Louisiana, 1879-80; Classical Instructor, New York, 1880-81; (*Greek*, 1878-79.)

32. ISAAC OTT, Physician, Easton, Pa.

From Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876-77; A. M., Lafayette, 1877; Associate Editor, Journal of Nervous and Mental Diseases; (*Biology*, 1878-79.)

Cocain, Veratria, and Gelsemium. (*Phila.*, 1874.)
Rapidity of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Katelectrotonus. (*Jour. of Nervous and Mental Diseases.*)
The Action of Medicine. (*Phila., Lindsay*, 1868.)
Sweat-Centres: The Action of Muscarin and Atropin on them. (*Jour. of Physiol.*, 1878.)
Observations on the Spinal Cord. (*Studies from the Biol. Lab., J. H. U.*, 1880; *Jour. of Physiol.*, 1879.)
Contributions to Physiology and Pathology of Nervous System, I, II, III. (*Phila.*, 1879-81.)
Also a large number of minor contributions to Phila. Med. Times, Boston Med. Journal; Jour. of Nerv. and Ment. Diseases, etc.

33. HENRY SEWALL, Ph. D., Associate in Biology.

From Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, 1876-78; Ph. D., Johns Hopkins, 1879; Student of Biology at Cambridge, Leipsic, and Heidelberg, 1879-80; (*Biology*, 1878-79)

Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Graduating Thesis, J. H. U.*, 1879; *Jour. of Physiol.*, 1878.)
On the Effect of Two Succeeding Stimuli upon Muscular Contraction. (*Jour. of Physiol.*, 1879.)
On the Changes in Pepsin-forming Glands during Secretion. (With J. N. Langley; *Jour. of Physiol.*, 1879.)
Zur Physiologie des Sehepithels, insbesondere der Fische. (With W. Kühne; *Untersuch., a. d. Physiol. Inst. z. Heidelberg*, 1880.)
A Note on the Processes Concerned in the Secretion of the Pepsin-forming Glands of the Frog. (*Studies from the Biol. Lab., J. H. U.*, 1881.)
On the Polar Influences upon Nerves of very weak Induction Currents. (*Jour. of Physiol.* 1882.)
Ueber die Summirung untermaximaler Reize in Muskeln. (With J. v. Kries, *Aus dem physiol. Inst. zu Leipzig; Archiv f. Anat. u. Physiol.*, 1881.)

34. WASHINGTON IRVING STRINGHAM, Ph. D., Parker Fellow of Harvard University, and Student of Philosophy in the University of Leipsic.

From Topeka, Kansas; A. B., Harvard, 1877; Graduate Student of Mathematics, 1877-78; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1878-80.)

Investigations in Quaternions. (*Proc. Am. Acad.*, 1878.)
Some General Formulae for Integrals of Irrational Functions. (*Am. Jour. of Math.*, 1879.)
The Quaternion Formulae for Quantification and for Barycentres. (*Am. Jour. of Math.*, 1879.)
Regular Figures in *n*- Dimensional Space. (*Graduating Thesis, J. H. U.*, 1880; *Am. Jour. of Math.*, 1880.)

35. ABRAM VAN EPPS YOUNG, Student of Chemistry at Harvard University.

From Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875-77; Graduate Student of Chemistry, 1877-78, 1881-82; (*Chemistry*, 1878-80.)

An Apparatus for Gas Analysis from Simple Laboratory Material. (*Am. Chem. Jour.*, 1879.)

36. CHARLES ROBERT HEMPHILL, Professor of Ancient Languages at the Southwestern Presbyterian University, Clarksville, Tenn.

From Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874-78; A. M., Davidson, 1878; (*Greek*, 1878-79.)

37. ALLAN MARQUAND, Ph. D., Lecturer on Modern Logic and Tutor in Latin at Princeton College.

From New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78; Ph. D., Johns Hopkins, 1880; (*Logic and Ethics*, 1877-80.)

The Logic of the Epicureans,—with a translation of a treatise of Philodemus—περὶ σημείων καὶ σημειώσεων. (*Graduating Thesis, J. H. U.*, 1880.)
On Logical Diagrams for *n*- Terms. (*Phil. Mag., October*, 1881.)

38. CHARLES AMBROSE VAN VELZER, Assistant Professor of Mathematics at the University of Wisconsin.

From Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876-77; (*Mathematics*, 1878-81.)

39. BROWN AYRES, Professor of Physics at the University of Louisiana, New Orleans.

From New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics, 1878-79; (*Physics*, 1879-80.)

The Gramme Machine. (*Sc. Amer. Supp.*, 1876.)
The Telephone. (*Jour. of Franklin Inst.*, 1878.)
New Arrangement for Telephone. (*Sc. Amer. Supp.*, 1878.)
Two New Forms of Bell Telephone. (*Jour. of Franklin Inst.*, 1878.)

40. LOUIS BEVIER, Ph. D., Student of Philology at the University of Bonn.

From Marbletown, N. Y.; A. B., Rutgers, 1878; Graduate Student of Greek, 1878-79; Ph. D., Johns Hopkins, 1881; (*Greek*, 1879-81.)

On the Genuineness of the First Antiphontean Oration. (*Graduating Thesis, J. H. U.*, 1881.)

41. EDWARD MUSSEY HARTWELL, Ph. D., Cincinnati, Ohio.

From Littleton, Mass.; Public Latin School, Boston, 1869; A. B., Amherst, 1873, and A. M., 1876; Vice Principal of High School, Orange, N. J., 1873-74; Instructor in Latin School, Boston, 1874-77; Student in Miami Medical College, 1877-78; Graduate Student of Biology and Chemistry, 1878-79; Ph. D., Johns Hopkins, 1881; M. D., Miami Medical College, 1882; (*Biology*, 1879-81.)

The Function of the Internal Intercostal Muscles. (With Prof. H. N. Martin; *Jour. of Physiol.*, 1879.)
The Legal Status of Anatomical Science. (*Jour. of Social Science*, 1880.)
American Anatomy Acts, five articles. (*Boston Med. and Surg. Jour.*, 1880.)
The Earliest English and American Medical Acts. (*Boston Med. and Surg. Jour.*, 1880.)
European and American Anatomy Acts Compared, two articles. (*Boston Med. and Surg. Jour.*, 1881.)
The Study of Human Anatomy Historically and Legally Considered. (*Studies from the Biol. Lab., J. H. U.*, 1881.)
The Hindrances to Anatomical Study in the United States, including a Special Record of the Struggles of Our Early Anatomical Teachers, three articles. (*Annals of Anat. and Surg.*, 1881.)
Notes on some points in the Anatomy and Physiology of the Slider Terrapin, Pseudemys rugosa. (*Graduating Thesis, J. H. U.*, 1881.)

42. JOHN ROBIN MCDANIEL IRBY, Ph. D.

From Lynchburg, Va.; Miller Scholar of University of Virginia, 1873-75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878; (*Mineralogy*, 1879-80.) *Died March* 25, 1880.

Eine kritische Untersuchung ueber die bei dem Kalkspath vorkommenden Skalenoeder, (Prize Essay of the University of Bonn, 1877, expanded and published under the title, On the Crystallography of Calcite, Bonn, 1878; *Groth's Zeitschrift, Bd. III.*)
Some Observations on the Crystalline State of Matter. (*Bull., Philos. Soc. of Washington*, 1879; *Smithsonian Misc. Coll., vol. XX.*)

43. MITSURU KUHARA, Ph. D., University of Tokio, Japan.

From Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, 1878-79; S. B., University of Tokio, 1877; Ph. D., Johns Hopkins, 1881; (*Chemistry*, 1879-81.)

On the Red Colouring Matter of the Lithospernum erythrorhizon. (*Jour. of Chem. Soc. London*, 1879.)
A Method of Estimating Bismuth Volumetrically. (*Am. Chem. Jour.*, 1879.)
Concerning Phthalimide. (*Am. Chem. Jour.*, 1881.)
On the Conduct of Nitro-Meta-Xylene towards Oxidizing Agents. (*Graduating Thesis, J. H. U.*, 1881; with Prof. Remsen, *Am. Chem. Jour.*, 1882.)

44. OSCAR HOWARD MITCHELL.

From Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875-78; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-82.)

On Binominal Congruences: Comprising an Extension of Fermat's and Wilson's Theorems and a Theorem of which both are Special Cases. (*Amer. Jour. of Math.*, 1881.)
Some Theorems in Numbers. (*Amer. Jour. of Math.*, 1881.)

45. EDWARD LEAMINGTON NICHOLS, Ph. D., Professor of Physics and Chemistry at Central University, Richmond, Ky.

From Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875-79; Ph. D., Göttingen, 1879; Physicist, Edison's Laboratory, Menlo Park, N. J., 1880-81; (*Physics*, 1879-80.)

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (*Pogg. Annalen*, 1878, N. F., Bd. 3.)
Ueber das von glühendem Platin ausgestrahlte Licht. (*Inaugural Dissertation, Göttingen*, 1879.)
On the Color of the Sky. (*Philos. Mag.*, 1879.)
On the Character and Intensity of the Rays emitted by glowing Platinum. (*Am. Jour. of Science* 1879.)
On the Measurement of High Temperatures. (*Am. Jour. of Science*, 1880.)
Salt Solutions and the Absorption of Gases. (*Proc. Am. Assoc.*, 1880.)
On the Co-efficient of Expansion of Gas Solutions. (With A. W. Wheeler; *Am. Assoc., Boston*, 1880; *Philos. Mag., Feb.*, 1881.)
Note on the Electrical Resistance and the Co-efficient of Expansion of Incandescent Platinum. (*Amer. Assoc., Cincinnati*, 1881; *Am. Jour. of Science, Nov.*, 1881.)
Electric Absorption of Crystals. (With Prof. Rowland; *Physical Soc., London; Philos. Mag., June*, 1881.)

46. WALDO SELDEN PRATT, Assistant Director of the Metropolitan Museum of Art, New York City.

From Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878, and A. M., 1881; Graduate Student of Greek and Archæology, 1878-79; (*Aesthetics and the History of Art*, 1879-80.)

Two Essays on the Columnar Architecture of the Egyptians. (*Proc. Am. Acad.*, 1880.)
The Origin and Development of Musical Scales. (*Princeton Review, Nov.*, 1881.)
The Church Organist. (*New Englander, Nov.*, 1881.)

47. WILLIAM THOMPSON SEDGWICK, Ph. D., Associate in Biology.

From Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877-78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878-79; Assistant in Biological Laboratory, 1880-81; (*Biology*, 1879-80.)

The Influence of Quinine upon the Reflex-excitability of the Spinal Cord. (*Jour. of Physiol.*, 1880; *Studies from the Biol. Lab., J. H. U.*, 1881; *Graduating Thesis, J. H. U.*, 1881.)
Observations on the Mean Pressure and the Characters of the Pulse-Wave in the Coronary Arteries of the Heart. (With Prof. Martin; *Jour. of Physiol., Jan.*, 1882; *abstract printed in Transactions, Medical and Chirurgical Faculty of Maryland*, 1881, *and in Studies from the Biol. Lab., J. H. U.*, 1882.)

48. HERMAN VOORHEES.

From Troy, N. Y.; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry, 1878-79; (*Chemistry*, 1879; *died October* 14, 1879, *without entering on the Fellowship, aged* 27 *years.*)

49. CHARLES OTIS WHITMAN, Ph. D., Leipsic, Germany.

From Newton Highlands, Mass.; A. B., Bowdoin, 1868, and A. M., 1871; Ph. D., Leipsic, 1878; Professor of Zoölogy at the University of Tokio, Japan, 1879-81. (*Biology*, 1879; *did not enter upon the Fellowship.*)

The Embryology of Clepsine. (*Quart. Jour. of Micros. Science*, 1878.)

50. EDMUND BEECHER WILSON, Ph. D., Assistant in the Biological Laboratory.

From Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877-79; Ph. D., Johns Hopkins, 1881; (*Biology*, 1879-81.)

Description of Two New Genera of Pycnogonida. (*Am. Jour. of Science*, 1878.)
The Pycnogonida of New England and Adjacent Waters. (*U. S. Fish Comm., Report*, 1877.)
A Synopsis of the Pycnogonida of New England. (*Conn. Acad.*, 1878.)
The Early Stages of Renilla. (*Am. Jour. of Science*, 1880.)
Origin and Significance of the Metamorphosis of Actinotrocha. (*Quar. Jour. of Micros. Science, April* 1881, 2 *plates; abstract in Am. Nat.*, 1882.)
Report on the Pycnogonida. (*Bull., Mus. Comp. Zoöl., Cambridge, Vol. VIII, No.* 12, 5 *plates.*)
The First Zoea of Porcellana. (With W. K. Brooks; *Studies from the Biol. Lab., J. H. U.*, 1881, 2 *plates.*)
Observations on the Early Developmental Stages of some Polychætous Annelides. (*Studies from the Biol. Lab., J. H. U.*, 1882; *abstract in Zoöl. Anzeiger*, 1880, *and in Am. Jour. of Science*, 1880.)

51. GEORGE FREDERICK NICOLASSEN, Assistant in Greek and Latin.

From Baltimore; A. B., University of Virginia, 1879, and A. M., 1880; (*Greek*, 1879-81.)

52. WILLIAM BURNEY, Ph. D., Professor of Chemistry at the South Carolina Agricultural College, Columbia.

From Davidson College, N. C.; S. B., Davidson, 1875; Student of Chemistry at Leipsic, Heidelberg, and Paris, 1875-79; Ph. D., Heidelberg, 1879; (*Chemistry*, 1879-80.)

On Erbium and Yttrium. (*Jour. of Chem. Soc., London*, 1879.)
Sulphoterephthalic Acid. (With Prof. Remsen; *Am. Chem. Jour.*, 1881.)

53. ROBERT WOODWORTH PRENTISS, Office of U. S. Nautical Almanac, Washington, D. C.

From New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-81.)

54. JAMES WILSON BRIGHT.

From Lock Haven, Pa.; A. B., Lafayette, 1877, and A. M., 1880; Graduate Student of Teutonic Languages, 1879-80; (*Teutonic Languages*, 1880-82.)

55. BENJAMIN CHAPMAN BURT, Assistant Professor of English and Rhetoric at the University of Michigan.

From Ann Arbor, Michigan; A. B., University of Michigan, 1875, and A. M., 1879; Professor of English Literature in Indiana State Normal School, 1875-78; Graduate Student of Philosophy, 1879-80; (*Philosophy*, 1880-81.)

Shakespeare and the Seventeenth Century. (*New Englander, May*, 1881.)
Kant and the Present. (*Unity, June*, 1881.)

56. SPENCER HEDDEN FREEMAN.

From Mumford, N. Y.; A. B., Rochester, 1875; and A. M., 1878; Teacher of Physical Science, Le Roy Academy, N. Y., 1875-76; Instructor in Mathematics and Physics, Denison University, 1876-78; Graduate Student of Physics and Mathematics, 1879-80; (*Physics*, 1880-82.)

57. KAKICHI MITSUKURI, Lecturer on Zoölogy at the University of Tokio, Japan.

From Tokio, Japan; Ph. B., Yale, 1879; Graduate Student of Biology, 1879-80; (*Biology*, 1880-81.)

Recent Changes in Japan. (*International Review, May*, 1881.)
On the Structure and Significance of some Aberrant Forms of Lamellibranchiate Gills. (*Quart. Jour. Micros. Sci., July*, 1881; *Studies from the Biol. Lab., J. H. U.*, 1882.)
On the Development of the Suprarenal Bodies in Mammalia. (*Quart. Jour. of Micros. Sci., Jan.*, 1882.)

58. BERNARD FRANCIS O'CONNOR.

From Paris, France; Bach. ès lettres, Université de France, 1874; Graduate Student of Romance Languages, 1879-80; (*Romance Languages*, 1880-82.)

French Verbs in *eler* and *eter*. (*Am. Jour. of Philol.*, 1880.)
Negative Particle *mie* in Old French. (*Am. Jour. of Philol.*, 1881.)

59. CHASE PALMER.

From Baltimore; Matriculated Student, 1876-79, A. B., 1879, and Graduate Student, 1879-80; (*Chemistry*, 1880-82.)

On the Oxidation of Metatoluene Sulphamide. (With Prof. Remsen; *Am. Chem. Jour.*, 1882; *in press*)

60. HERBERT MILLS PERRY.

From New Ipswich, N. H.; Appleton Academy, N. H., 1868-71; Phillips Academy, Exeter, N. H., 1876; A. B., Harvard, 1880; (*Mathematics*, 1880-82.)

61. WILLIAM LEE ROWLAND, Philadelphia.

From Springfield, Mass.; Springfield High School; Massachusetts Inst. of Technology; S. B., University of Pennsylvania, 1878, and Assistant in Chemistry, 1878-80; (*Chemistry*, 1880; *did not enter upon the Fellowship.*)

62. EDWARD HENRY SPIEKER.

From Baltimore; Matriculated Student, 1877-79, A. B., 1879, and Graduate Student, 1879-80; (*Greek*, 1880-82.)

63. MORRISON ISAAC SWIFT.

From Ashtabula, Ohio; Grand River Institute, Ohio, 1874-75; Western Reserve College, 1875-77; Williams College, 1877-79, and A. B., 1879; Graduate Student of Greek and Philosophy, 1879-80; (*Philosophy*, 1880-82.)

64. ARTHUR WILSON WHEELER.

From Rockland, Mass.; A. B., Amherst, 1879; Graduate Student of Physics, 1880; (*Physics*, 1880-81.) *Died January 6, 1881, aged 21 years.*

On the Co-efficient of Expansion of Gas Solutions. (With E. L. Nichols; *Am. Assoc., Boston*, 1880; *abstract in Science*, 1880.)

65. ROBERT DORSEY COALE, Ph. D., Assistant in Chemical Laboratory.

From Baltimore; C. E., Pennsylvania Military Academy, 1875; Special Student of Chemistry, 1876-80; Ph. D., Johns Hopkins, 1881; (*Chemistry*, 1880-81.)

On Anhydrosulphamineisophthalic Acid. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1879.)
Oxidation of Sulphamine metatoluic Acid in Alkaline and in Acid Solution. (With Prof. Remsen; *Am. Chem. Jour.*, 1881.)
On Sulphamine- and Sulphoisophthalic Acids. (*Graduating Thesis, J. H. U.*, 1881.)

66. ANDREAS FRANZ WILHELM SCHIMPER, Ph. D., University of Bonn, Germany.

From Strassburg, Germany; Gymnasium at Strassburg, 1864-1874; Ph. D., Strassburg, 1878; Assistant and Provisional Director in the Museum of Natural History, Strassburg, 1878-80; (*Biology*, 1880-81.)

Blödit und Glauberit von Vurcha in Pendschab. (*Zeitsch. für Krystallographie*, 1877.)
Untersuchungen über die Proteinkrystalloide der Pflanzen. (*Inaugural Dissertation, Strassburg*, 1878.)
Kupferkies in *Groth*, "Die Mineraliensammlung der Universität Strassburg." (*Strassburg*, 1879.)
Die Vegetationsorgane von Prosopanche Burmeisteri. (*Abhandl. der naturfors. Ges. zu Halle*, 1880.)
Die Krystallisation der eiweissartigen Substanzen. (*Zeitsch. für Krystallographie*, 1880.)
Untersuchungen über die Entstehung der Stärkekörner. (*Botanische Zeitung*, 1880.)
Researches upon the Development of Starch Grains. (*Quart. Jour. of Micros. Sci., April*, 1881; *Studies from the Biol. Lab., J. H. U.*, 1882.)

67. LAWRENCE BUNTING FLETCHER, Ph. D., Assistant in Physics at the University of Pennsylvania.

From New York City; A. B., Columbia, 1877, and A. M., 1880; Fellow in Science, Columbia, 1877-80; Ph. D., Johns Hopkins, 1881; Assistant in Physical Laboratory, 1881; (*Physics*, 1880-81.)

Note on the Relation between the Mechanical Equivalent of Heat and the Ohm. (*Phil. Mag.*, 1881.)

68. WILLIAM JOHN ALEXANDER.

From Hamilton, Ontario; Scholar of the University of Toronto, 1873; Canadian Gilchrist Scholar and Student of University College, London, 1874-77; A. B., University of London, 1876; Graduate Student of Greek, 1879-81; (*Greek*, 1881-82.)

69. EDWARD SANDFORD BURGESS.

From Silver Creek, N. Y.; Fredonia State Normal School, N. Y., 1875; A. B., Hamilton, 1879; Instructor in Greek and Latin at Delaware Literary Institute, Franklin, N. Y., 1879-80; Graduate Student of Greek and Latin, 1880-81; (*Greek*, 1881-82.)

70. WILLIAM JAMES COMSTOCK.

From Toledo, Ohio; Williston Seminary, Easthampton, Mass., 1876; Ph. B., Yale, 1879; Graduate Student at Sheffield Scientific School, 1879-80; Assistant in Chemistry and Instructor in Mineralogy at Sheffield Scientific School, 1880-81; (*Chemistry*, 1881-82.)

Tetrahedrite from Huallanca, Peru. (*Am. Jour. of Science*, 1879.)
Analyses of some American Tantalates. (*Am. Jour. of Science*, 1880.)

On the Chemical Composition of Uraninite from Branchville, Conn. (*Am. Jour. of Science*, 1880.)

Bastnäsite and Tysonite from Colorado. (With Prof. O. D. Allen; *Am. Jour. of Science*, 1880.)

Analyses of Onofrite from Utah. (*Am. Jour. of Science; Zeitsch. für Krystallographie*, 1881.)

71. WILLIAM CATHCART DAY.

From Baltimore; Matriculated Student, 1877-80, A. B., 1880, and Graduate Student, 1880-81; (*Chemistry*, 1881-82.)

Determinations of Chromium in Chrome Iron Ore. (With H. N. Morse; *Am. Chem. Jour.*, 1881.)

72. HENRY HERBERT DONALDSON.

From New York City; Phillips Academy, Andover, 1875; A. B., Yale, 1879; Student in Chemistry, Sheffield Scientific School, 1879-80; College of Physicians and Surgeons, N. Y., 1880-81; (*Biology*, 1881-82.)

73. WILLIAM PITT DURFEE.

From Berkeley, Cal.; A. B., University of Michigan, 1876; Instructor in Mathematics, Berkeley, Cal., 1877-81; Graduate Student of Mathematics, 1881; (*Mathematics*, 1881-82.)

Tables of Symmetric Functions of the Roots of the Twelfthic. (*Am. Jour. of Math.*, 1882.)

74. GEORGE STETSON ELY.

From Fredonia, N. Y.; A. B., Amherst, 1878; Instructor in Mathematics, University of Michigan, 1880-81; (*Mathematics*, 1881-82.)

75. JOHN FRANKLIN JAMESON.

From Amherst, Mass.; A. B., Amherst, 1879; Instructor in the Worcester (Mass.) High School, 1879-80; Graduate Student of History, 1880-81; (*History*, 1881-82.)

76. CHARLES HERSCHEL KOYL.

From Cobourg, Ontario; A. B., Victoria University, Ont., 1877; Science Master at Wesleyan College, Stanstead, Quebec, 1877-79; Graduate Student of Physics, 1879-81; (*Physics*, 1881-82.)

The Colors of Thin Blow-pipe Deposits. (*Am. Jour. of Science, Sept.*, 1880; *Phil. Mag., Oct.*, 1880.)

77. HENRY LESLIE OSBORN.

From Madison, N. J.; A. B., Wesleyan University, 1878; Assistant in Natural History, Wesleyan University, 1878-81; (*Biology*, 1881-82.)

78. HENRY NEWLIN STOKES.

From Moorestown, N. J.; S. B., Haverford, 1878; Graduate Student of Chemistry, 1878-81; (*Biology*, 1881-82.)

79. BENJAMIN W. WELLS, Ph. D., Instructor in English at the Friends' School, Providence, R. I.

From Boston, Mass.; A. B., Harvard, 1877, and Ph. D., 1880; (*English*, 1881; *did not enter upon the Fellowship.*)

History of the *a*-Vowel, from Old Germanic to Modern English. (*Trans. Am. Philol. Assoc.*, 1881.)

80. BENJAMIN IVES GILMAN.

From New York City; A. B., Williams, 1872, and A. M., 1880; Graduate Student of Logic, 1879-81; (*Logic*, 1881-82.)

C.

Degrees Conferred.

HONORARY.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Non-Resident Professor, Cornell University.

THOMAS CRAIG. (F).
C. E., Lafayette, 1875.—Associate, Johns Hopkins University.

JOSIAH ROYCE. (F).
A. B., University of California.—Instructor, University of California.

ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor, Williams College.

GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Instructor, Princeton College.

EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor, Lafayette College.

WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Techn., 1876.—Electrician, Boston, Mass.

HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Associate, Johns Hopkins University. (6)

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.
Baltimore.

CHASE PALMER. (F).
Fellow, Johns Hopkins University.

EDWARD HENRY SPIEKER. (F).
Fellow, Johns Hopkins University. (3)

*The full academic record of those marked "F," is given in the Roll of Fellows, pp. 28–42.

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Asst. Professor, Haverford College.

FABIAN FRANKLIN. (F).
Ph. B., Columbian, 1869.—Assistant, Johns Hopkins University.

EDWIN HERBERT HALL. (F).
A. B , Bowdoin, 1875.—Instructor, Harvard University.

ALLAN MARQUAND. (F).
A. B., Princeton, 1874.—Instructor, Princeton College.

WASHINGTON IRVING STRINGHAM. (F).
A. B., Harvard, 1877.—Fellow, Harvard University. (5)

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF.
Graduate Student, Johns Hopkins University.

ALLEN KERR BOND.
M. D., University of Maryland, 1882.

WILLIAM CATHCART DAY. (F).
Fellow, Johns Hopkins University.

HENRY LAURENCE GANTT.
Instructor, McDonogh School.

EDGAR GOODMAN.
Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER.
Va. Theological Seminary.

ALEXANDER FRIDGE JAMIESON.
Instructor, New Brunswick, N. J.

EDMUND ALLEN JARVIS.
Died, October 15, 1880.

STEWART BRIAN LINTHICUM.
Graduate Student, Johns Hopkins University.

JOHN HANSON LOWE.
Law Dept., University of Maryland.

LEIGH CLINTON MORGAN.
Clergyman, Montgomery County.

NELSON PALMER.
Baltimore.

THOMAS PETTIGREW.
Creswell, N. C.

HARRY FIELDING REID.
Graduate Student, Johns Hopkins University.

WILTZ RAYMOND STRICKLEN.
Clergyman, Berkeley Springs, W. Va.

LEWIS WEBB WILHELM.
Graduate Scholar, Johns Hopkins University. (16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F).
A. B., Rutgers, 1878.—Student of Philology, University of Bonn.

ROBERT DORSEY COALE. (F).
Assistant, Johns Hopkins University.

EDWARD ALLEN FAY.
A. B., University of Michigan, 1862.—Professor, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F).
A. B., Columbia, 1877.—Assistant, University of Pennsylvania.

SAMUEL GARNER.
A. B., St. Johns, 1871.—Professor, University of Indiana.

EDWARD MUSSEY HARTWELL. (F).
A. B., Amherst, 1873.

WILLIAM THOMPSON SEDGWICK. (F).
Ph. B., Yale, 1877.—Associate, Johns Hopkins University.

CHRISTIAN SIHLER. (F).
Concordia, 1866.—Physician, Cleveland, Ohio.

EDMUND BEECHER WILSON. (F).
Ph. B., Yale, 1878.—Assistant, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN.
Law Dept., University of Maryland.

HENRY JOHNS BOWDOIN.
Law Dept., University of Maryland.

JOHN WILSON BROWN.
Baltimore.

DAVID TALBOTT DAY.
Graduate Student, Johns Hopkins University.

WILLIAM HENRY HOWELL.
Graduate Scholar, Johns Hopkins University.

JOHN JOHNSON.
Instructor, McDonogh School.

JAMES EDWARD KEELER.
Assistant, Allegheny (Pa.) Astronomical Observatory.

EDWIN GEORGE RICHARDSON.
Divinity School, Philadelphia.

ADONIRAM JUDSON ROBINSON.
Instructor, Reisterstown, Md.

HENRY ROLANDO.
Medical Dept., University of Maryland.

LEE SALE.
Student of Law, Louisville, Ky.

MACTIER WARFIELD.
Graduate Student, Johns Hopkins University. (12)

TOTAL (1878-81.)

DOCTORS OF PHILOSOPHY, ...	24.
BACHELORS OF ARTS, ...	31.

D.

System of Fellowships.

Twenty Fellowships are annually open to competition in this University, each yielding five hundred dollars and exempting the holder from all charges for tuition.

OBJECT OF THE FOUNDATION.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions (though such persons have not been formally excluded from the competition) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The Professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and desirable posts in different parts of the country.

The number of applications for Fellowships has been very large, and it may have happened that some candidates have failed of appointment who were really superior to those selected. But if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the University merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the Professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that Graduate Students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but the absence of candidates from Baltimore has been no bar to their appointment, in cases where adequate evidence of their claims has been presented.

Regulations.

1. The application must be made in writing.

2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.

3. The value of each Fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the Fellowship, payments will be made for the time during which the office shall have been actually held.

4. Every holder of a Fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the University, as circumstances may suggest. He must reside in Baltimore, during the academic year.

5. He will be expected to devote his time to the prosecution of special study (not professional) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.

6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.

7. He may be re-appointed at the end of the year.

8. The appointments are usually made as follows:

In Mathematics, three; Chemistry, three; Physics, three; Biology, three; Greek, three; other subjects, five.

9. *Applications for the next year should reach the University before May* 12, 1882.

E.

Report of Chesapeake Zoölogical Laboratory.

FOR THE FOURTH YEAR.

Summer of 1881, Beaufort, N. C.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Fourth Session of the Chesapeake Zoölogical Laboratory.

The Laboratory was opened for work at Beaufort, N. C. on May 1, 1881, and it was closed on Sept. 1, although three members of the party remained there several weeks longer, to complete the researches upon which they were engaged.

The following is a list of the members of the party.

W. K. BROOKS, *Director.*
E. B. Wilson, *Assistant.*
S. F. Clarke, *Assistant.*
H. Sewall, *Associate in Biology, J. H. U.*
P. R. Uhler, *Associate in Biology, J. H. U.*
H. J. Rice, *Prof., Natural Science, Mich. Mil. Acad., Orchard Lake, Mich.*
J. Playfair McMurrich, *Assistant in Biology, Univ. of Toronto, Ont.*
Buel P. Colton, *Teacher of Natural Science, Princeton High School, Princeton, Ill.*
H. Garman, *Assistant, State Lab. Nat. Hist., Normal, Ill.*
Jas. E. Armstrong, *Assist., Nat. Hist., Ill. Indust. Univ., Champaign, Ill.*
W. L. Norris, *Arlington, Ill.*
Fernando Sanford, *Professor, Natural Science, Mount Morris College, Mount Morris, Ill.*

The five last named came to Beaufort to attend the elementary class which was conducted by Dr. Clarke, but all, except the two last, remained at the laboratory and engaged in research after the elementary course was finished, and two of them returned to Baltimore and have spent the year in the Biological laboratory.

For six weeks there were eleven in our party, and as the house we have rented for a laboratory furnishes accommodations for only six, a second house was rented for the summer months.

The selection of a site for a three years' session has enabled us to engage in researches which demand considerable time, and cannot be finished in one season, and although I have a smaller number of finished papers to report than in previous years, this is not due to inactivity, but to the more exhaustive character of our work.

Dr. Wilson has completed his studies of the development of marine annelids, upon which he was engaged during the summer of 1880, and an illustrated paper by him on this subject is now in press, and will appear in a few days. Almost all his time this season has been devoted to the study of the structure and development of Renilla, a subject in which

he and Mr. Mitsukuri made a beginning, in 1880, as I have mentioned in a previous report. Great difficulty was found in procuring the very early stages, and it was not until more than six months had been spent in fruitless efforts that he succeeded in obtaining a supply of fertilized eggs, and in rearing the young.

At every stage the research presented great difficulties, and it has occupied almost the entire time of Dr. Wilson for two years, but the work is now nearly completed, and I hope that in a few months his results, which are of very great interest and importance, will be made public.

Dr. Sewall devoted three months to a physiological investigation, the study of the equilibrating function of the semicircular canals. Marine or aquatic vertebrates are peculiarly adapted for this study, since the body is buoyed up by the water, and as the semicircular canals of the shark's ear are very large they were selected for experiment. An abstract of his observations, which show that the semicircular canals are not an equilibrating organ, has been published, but another season's work will be necessary before the full account can be prepared for publication.

Prof. McMurrich has published an account of his studies of the "test cells" of ascidian eggs, and he also made a beginning in the study of the development of the skull in the Syngnathidae.

A paper, with illustrations, giving an account of the transformation of the Pluteus of Arbacia into the young sea urchin, by Mr. Colton and Mr. Garman, will appear in a few days.

Enough progress was made in my own study of the Medusae of Beaufort to enable me to print a list of the Beaufort species, with descriptions of the new ones. The list is now in press and it will appear in a few days.

I hope that the coming season's work will enable me to print a larger illustrated paper on this subject, as I now have more than three hundred drawings.

I also made satisfactory progress in the study of the development of the Macroura and traced the life history in several important genera. This work will employ me for several years, and although my notes on certain genera are now nearly complete I have not yet prepared any of them for publication except a paper on the metamorphosis of Lucifer, which has been printed with eleven plates, in the Phil. Trans. of the Royal Society. The chief importance of this work will be in the comparison of the various forms, and as this cannot be fully illustrated until I have completed all my observations, it seems best to lay my results aside until I have all the material which I need for an exhaustive monograph of the subject.

During five weeks in July and August, Dr. S. F. Clarke conducted, at the laboratory, an elementary course in Zoölogy, lecturing daily, and aiding the members of his class in the dissection and study of typical marine animals. All the members of this class were teachers of natural science, who had already worked at Zoölogy, but had not, before, found opportunities for the thorough study of marine forms. The course was so

profitable that several members of the class were able, after it closed, to engage in original research under my direction, and to make valuable additions to knowledge. With proper facilities at the laboratory, elementary instruction of this sort might be made an important feature of our work, but we all suffered from over-crowding last summer, and our present accommodations are no more than sufficient for the advanced workers who wish to make use of them.

Very respectfully yours,

W. K. BROOKS.

F.

Report on the Saturday Class in Latin.

To the President of the Johns Hopkins University:

SIR: The class for the instruction of Teachers in the elements of Latin was held for the first time on October 23, 1880, and was continued on successive Saturdays to March 19, 1881, excepting December 25 and January 1. There were therefore in all twenty sessions, and each session lasted two hours, from ten a. m. to twelve m. In the original announcement of this course the following points deserve attention:

(1) Formal instruction was offered to those only who had no knowledge whatever of Latin to begin with.

(2) Teachers who by reason of the above restriction were prevented from joining the class formally were invited to be present as auditors, if they thought it desirable.

It was no doubt the rigid adherence to the former of these points that prevented the class proper from reaching the proposed number of twenty persons. There were, originally, I think, only eleven applicants; of these two dropped out after a few lessons, and three joined later; so that twelve may be taken as the average number of members of the formal class. But besides these there were present daily a number of auditors varying from six to twelve or fourteen, usually the larger number: many of these were quite as regular in their attendance as the members of the class itself and manifested a great degree of interest in the proceedings. I made little notes of the work done on each day. These of course can be of no general interest; but I may say that I find that on November 27, the 6th lesson, the class was able to make out a small passage of Cæsar. From that time on a large part of each session was devoted to the work of practice in interpreting continuous Latin; and I find that on January 29, the 13th lesson, I began the 2nd book of the Æneid with them, at first merely explaining the metre and teaching them how to scan it. By the time the last session was reached the class had read with me some twenty chapters of Cæsar, B. G., and some hundred or more lines of Virgil. They were well acquainted

with the forms and general syntax: with the principles of the *Oratio Obliqua*, and with Prosody: and were, in a word, so far advanced into the heart of the subject, that I am convinced that each member of the class felt a sure confidence that the path was now open and clear for an intelligent and delightful progress in the knowledge of Latin, if he should choose to keep up the study.

The success of the experiment was very gratifying to me. Considerably more could have been accomplished in the same amount of time if the class had had leisure to do more work in the intervals between the lessons. But it is to be remembered that they were all teachers, whose week-days were fully occupied with exhausting labour, and who could therefore steal only a few quarter hours to make preparation for the Saturday's Latin class. Under the circumstances I think they did admirably well: and I am personally so well satisfied with the result, that I shall be ready at any time to make a similar experiment in the teaching of Greek, if it seem to the authorities of the University to be worth while: and I shall confidently anticipate an even more conspicuous success. For I am convinced that in no other method so well can the principles of teaching languages be applied, which Prof. Gildersleeve has so clearly enunciated: "the maximum of forms, the minimum of syntax, and early contact with the language in mass."

CHARLES D. MORRIS.

June 3, 1881.

G.

Report of the Librarian.

The report of the Librarian, Dr. W. Hand Browne, dated June 1, 1881, referred in part to matters of internal administration. The following extracts are of more general interest:—

During the summer of 1880 I took in hand the subject catalogue, which was greatly needed, and trust to finish it this summer. Instead of attempting the whole at once, in which case no part would have been serviceable until all was done, I took up and catalogued single departments at a time. The departments of Biology (including Botany, Medicine, and Hygiene); Chemistry (including Mineralogy, Geology, and Palaeontology); Physics (including Mechanics and Engineering); Mathematics (including Astronomy); Greek and Latin authors and Philology; English Language and Literature; Romance Languages and Literature; and Philosophy (including Logic and Metaphysics)—are all complete to date and in use.

Our small philosophical library has been increased by the purchase of a valuable collection of 295 volumes (210 titles) from the library of Prof. C. S. Peirce. This collection, made with much care by Prof. Peirce for

his own use, follows the whole stream of philosophic thought from Aristotle to our own times, and is particularly rich in specimens of the leading metaphysical, logical, and theological works of the great Scholastic Doctors. Many of the books are of great rarity and beauty; a number are *incunabula*, and interesting from a bibliographical point of view; and there are among them several valuable manuscripts, one of which, a handsome MS. on vellum of the *Sententiae* of Petrus Lombardus, is said—for it has no colophon—to be as early as the twelfth century. It is doubtful whether a similar collection exists in any library in this country.

There have been received as gifts during the year 113 volumes and 36 pamphlets of more than ephemeral value. To the kindness of Mr. Henry Holt, of New York, we are indebted for 41 volumes of recent publications of his firm, comprising valuable works of biography, travel, history, art, belles-lettres, &c. Prince Louis Lucien Bonaparte, of London, has presented us with a series of seven versions, in various dialects, of the Gospel of St. Matthew, printed at his private expense. The Very Rev. A. Magnien, Rector of St. Mary's Seminary, has given us eleven handsomely bound volumes, and the Rev. J. Perron, President of Woodstock College, five volumes from the press of that college. We are also indebted to the Provost and Senior Fellows of Trinity College, Dublin, for a copy of their noble folio edition of *The Book of Leinster*, being a collection of poetic and historical writings in the Irish language compiled in the 12th century, and now reproduced in fac simile from the original MS. in the library of Trinity College.

We have now on our shelves 10,572 bound volumes, an increase of 2,541 volumes, or 1,551 titles since June 1, 1880.

[Since this report was made, the subject-catalogue has been completed, and the number of bound volumes increased to over 12,000.]

H.

List of Donors to the Library, September 1, 1880, to September 1, 1881.

ALLAN, COL. W. (Author). Campaign of Genl. T. J. Jackson in the Shenandoah Valley. Philadelphia: 1880. O.

AUSTIN, T. T. Aromatische nitroverbindungen. Berlin: 1876. O.

BILLINGS, J. S., M. D., Surgeon U. S. A. Index Catalogue of Library of Surgeon-General's Office. Vols. 1 and 2. Washington: 1880-81. O.

BONAPARTE, PRINCE LOUIS LUCIEN. Seven dialectic versions of St. Matthew's Gospel. London. (v. d.) D.

BRANDT, H. C. G. Lessing's Nathan, with introduction and notes. New York: 1880. D.

BROOKS, DR. W. K. Hall, J. Natural History of New York. Palæontography. 2 vols. Albany: 1880. Q.

BROWN, HON. GEO. WM. (Author). Sketch of the Life of Thos. Donaldson. Baltimore: 1881. O.

CLARKE, C. C. P. (Author). The Commonwealth Reconstructed. New York: 1878. O.

COOK, G. H. Report of State Geologist of New Jersey. Trenton: 1880. O.

DUNSTER, S. (Author). Henry Dunster and His Descendants. Central Falls: 1876. D.

FLINT, C. L. Twenty-first Annual Report Massachusetts Board of Agriculture. Boston: 1874. O.

GILMAN, PRESIDENT D. C. Miscellaneous Writings of F. Lieber. 2 vols. Philadelphia: 1881. O.

GORE, G., LL. D., F. R. S. (Author). The Art of Scientific Discovery. London: 1878. D.

GREEN, S. A., M. D. Green's Early Record of Groton. Groton: 1880. O.
Ellis, G. E. Memoir of J. Bigelow. Cambridge: 1880. O.

HALLIWELL-PHILLIPPS, J. O. (Author). Memoranda on the Tragedy of Hamlet. London: 1879. O.
Memoranda on Love's Labour's Lost. London: 1879. O.

HAZARD, R. (Author). The Credit Mobilier of America. Providence: 1881. O.

HOLT, H. Baker, H. B. English Actors. 2 vols. New York: 1879. D.
Baker, J. Turkey. New York: 1879. O.
Beerbohm, J. Wanderings in Patagonia. New York: 1879. D.
Beers, H. A. A Century of American Literature. New York: 1878. D.
Berlioz, H. Selections from Letters, &c. New York: 1879. D.
Bessey, C. E. Botany for High Schools and Colleges. New York: 1880. O.
Brassey, A. Around the World. New York: 1880. O.
Brassey, A. Sunshine and Storm. New York: 1880. O.
Conway, M. D. Demonology. 2 vols. New York: 1879. O.
Cory, W. Guide to English History, I. New York: 1880. O.
Creasy, Sir E. S. History of the Ottoman Turks. New York: 1878. O.
Democracy. New York: 1880. D.
Dobson, A. Vignettes in Rhyme. New York: 1880. D.
Escott, T. H. S. England, Her People, &c. New York: 1880. O.
Farrer, J. A. Primitive Manners. New York: 1879. D.
Fothergill, F. The First Violin. New York: 1878. D.
Goodholme, T. S. Domestic Cyclopædia. New York: 1877. Q.
Grohman, W. A. B. Gaddings with a Primitive People. New York: 1878. D.
Hardy, T. The Trumpet-major. New York: 1880. D.
Hillebrand, K. German Thought. New York: 1880. D.
Jackson, Lady C. C. Old Paris. New York: 1880. D.
James, H. A. Communism in America. New York: 1879. Q.
Janvier, C. A. Practical Keramics. New York: 1880. O.
Johnson, R. Famous Poems. New York: 1880. D.
Johnston, A. American Politics. New York: 1880. D.
Kemble, F. A. Records of a Girlhood. New York: 1880. O.
Lewes, G. H. Actors and Acting. New York: 1880. D.
McCoan, J. C. Egypt As It Is. New York: 1877. O.
Morgan, L. H. Ancient Society. New York: 1878. O.
Newcomb & Holden. Astronomy for Students. New York: 1880. O.
Packard, A. S. Zoölogy for High Schools and Colleges. New York: 1880. O.
Rydberg, V. Magic of the Middle Ages. New York: 1879. D.
Symonds, J. A. Renaissance in Italy. New York: 1879. O.
Taine, H. The French Revolution, I. New York: 1880. O.
Thornbury, W. Life of Turner. New York: 1877. O.
Turgenieff, I. Virgin Soil. New York: 1877. D.
Tylor, E. B. Early History of Mankind. New York: 1878. O.
Walker, F. A. Money. New York: 1878. O.
Wright, C. Philosophical Discussions. New York: 1878. O.

KUHARA, M. Journal of Chemical Society, Tokio, Japan. 1880. O.

LINDSLEY, J. B., M. D. Report of Board of Health, Nashville, Tenn.: 1879. O.

MCLANE, HON. R. M. Journals of Congress, 1879-80. 2 vols. Washington: 1880. O.

MAGNIEN, VERY REV. A. Vallet, P. Prælectiones Philosophicae. 2 vols. Paris: 1880. D.
Bonal, A. Institutiones Theologicae. 6 vols. Toulouse: 1879. D.
Icard, H. J. Prælectiones Juris Canonici. 3 vols. Paris: 1880. D.

MALLERY, G., LT. COL. Study of Sign-Language among the N. A. Indians. Washington. 1880. Q.

MARQUAND, A. The Princeton Book. Boston: 1879. F.

MARTIN, PROF. H. N. (Author). The Human Body. New York; 1881. O.

MERRILL, C. W. Bulletins of Cincinnati Pub. Library. 2 vols. 1879-80. Q.

MITSUKURI, K. Modern History of Japan, (*Japanese*). 4 vols. O.

MORSE, J. T. (Author). Life of Hamilton. 2 vols. Boston: 1876. D.

NEWCOMB, PROF. S. American Ephemeris for 1883. Washington: 1880. O.
Catalogue of Stars. Washington: 1881. Q.

NEW YORK STATE LIBRARY. Civil List, &c., of New York. Albany: 1870. D.
Centennial Celebrations of New York. Albany: 1879. O.

PERRON, J., REV., S. J., PRESIDENT OF WOODSTOCK COLLEGE.
De Augustinis, A. M. De Re Sacramentaria. 2 vols. Woodstock, Md. O.
Mazzella, C. De Deo Creante. Woodstock, Md. O.
Mazzella, C. De Gratia Christi. Woodstock, Md. O.
Mazzella, C. De Religione et Ecclesia. Woodstock, Md. O.

ROBB, J. A. Financial Reports, Mayor and City Council for 1880. Baltimore: 1881. O.

RODGERS, ADL. J. U. S. Naval Observatory Reports on Solar Eclipses. Washington: 1880. Q.

SALISBURY, E. E. Biographical Memoranda of Class of 1832, Yale College. New Haven: 1880. Q.

SCUDDER, S. H. (Author). Devonian Insects of New Brunswick. Boston: 1880. Q.

SEYFFARTH, PROF. G. (Author). Discoveries in Biblical Chronology. New York: 1859. D.

SYLVESTER, PROF. J. J. Walker, J. T. History of the Great Trigonometrical Survey of India. Vols. 5 and 6. Dehra Dun.: 1879-80. Q.
Compte Rendu de l'Association Française. Paris: 1878. O.

SMITHSONIAN INSTITUTION. Annual Report. Washington. O.
Henry's Researches in Sound. Washington. O.
Memorial of Joseph Henry. Washington. O.

TRINITY COLLEGE, DUBLIN. The Book of Leinster. Dublin: 1880. F.

TRUSTEES OF J. HENRY. Henry's Aeneidea. 3 vols. London: 1873-9. O.

UNITED STATES. Coast and Geodetic Survey.
Report for 1877. Washington: 1880. Q.

UNITED STATES. *Department of Interior.*
Report on Rocky Mountain Locust. Washington: 1880. Q.
Leidy, J. Freshwater Rhizopods. Washington: 1879. Q.

UNITED STATES. Geological and Geographical Survey.
Allen, B. J. History N. A. Pinnipeds. Washington: 1880. O.
Dalton, C. E. Geology of High Plateaus of Utah. Washington: 1880.

UNITED STATES. War Department.
Report of Chief of Engineers. Washington: 1879. O.

WARREN, PROF. M. Babucke, H. De Quintiliani doctrina. Regimonti: 1866. O.

WEEKS, R. D. (Author.) Jehovah Jesus. New York: 1880. D.

Pamphlets, *brochures*, etc., have been received from the following donors:

Azarias, Brother; Bogart, J.; Chisholm, J. J., M. D.; Davenport Academy of Natural Science; Gilman, President D. C.; Hale, Rev. C. R.; Hartwell, E. M.; Hazen, A. D.; Holmes, H. A.; Hunt, T. S.; Jones, C. J.; Kimmel, Hon. W.; Maryland Historical Society; Medical and Chirurgical Faculty of Md.; Pacini, F., M. D.; Peyton, J. L.; Ross, D. W.; St. Louis Academy of Sciences; Sherman, Gen. W. T.; Smart, J. H.; Theobald, S., M. D.; University of California; United States Departments.

I.

Publications.

The following Scientific Periodicals are issued under the auspices of the University:—

I. American Journal of Mathematics. (Professor J. J. SYLVESTER, Editor). Quarto. Four numbers make a volume. Vol. I, 1878-79, (388 pp., 4 plates); Vol. II, 1879-80, (408 pp., 3 plates); Vol. III, 1880-81, (398 pp., 3 plates); Vol. IV, 1881-82. Subscription price, per vol., $5.00, price per number, $1.50.

II. American Chemical Journal. (Professor IRA REMSEN, Editor). Six numbers make a volume. Vol. I, 1879-80, (460 pp.); Vol. II, 1880-81, (456 pp.); Vol. III, 1881-82, (472 pp.); Vol. IV, 1882-83. Subscription price, per vol., $3.00, price per number, 50 cents.

III. Studies from the Biological Laboratory. (Professor H. N. MARTIN and Dr. W. K. BROOKS, Editors). Four numbers make a volume. Vol. I, 1879-80, (496 pp., 39 plates); Vol. II, (In progress). Price, per vol., $5.00; price per number, $1.50.

IV. The American Journal of Philology. (Professor B. L. GILDERSLEEVE, Editor.) Four numbers make a volume. Vol. I, 1880, (539 pp.); Vol. II, 1881, (574 pp.); Vol. III, 1882. Subscription price, $3.00 per volume.

The Journal of Physiology. (MICHAEL FOSTER, M. D., F. R. S., Cambridge, England, Editor in Chief.) This Journal will in future be published in America with the aid of the Johns Hopkins University, and will be issued from the University to subscribers. Six parts form a volume. Vol. I, 1878-79, (626 pp., 17 plates); Vol. II, 1879-80, (596 pp., 13 plates); Vol. III, (In progress). Subscription price, $5.00 per volume.

The Official Publications of the University are as follows:

I. An ANNUAL REPORT presented by the President to the Board of Trustees, reviewing the operations of the University during the past academic year.

II. The UNIVERSITY CIRCULARS, issued from time to time, and giving current information as to the work here in progress or proposed.

III. A REGISTER giving a list of the officers, academic staff, and students, stating generally the nature and amount of the instruction given and work actually done or in progress during the current year, and exhibiting in detail the scheme and regulations of the University.

Announcements of proposed lectures, courses of instruction, etc., appear in the University Circulars, or are separately issued from time to time.

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This Report covers the Academic year ending September 1, 1881. The Appendix contains some statements of a more recent date.

SEVENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore Maryland

1882

ACADEMIC STAFF, 1882–83.

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Charles D. Morris, A. M., . . . (*Collegiate*) *Greek and Latin.*
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Minton Warren, Ph. D., ... *Latin.*
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R. Dorsey Coale, Ph. D., ... *Chemistry.*
Edward M. Hartwell, Ph. D., M. D., . . . *Physical Culture.*
J. Franklin Jameson, Ph. D., ... *History.*
Philippe B. Marcou, A. M., ... *French.*
Hugh Newell, ... *Drawing.*
Harry F. Reid, A. B., ... *Physics.*
Edward H. Spieker, Ph. D., ... *Greek and Latin.*
Charles L. Woodworth, Jr., ... *Elocution.*

The names in each group are arranged alphabetically.

SEVENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore Maryland

1882

BALTIMORE
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET
1882

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SEVENTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University:

You requested me by a formal resolution to present in my last report a review of the work done in the various departments of this university since the opening in 1876, but circumstances beyond my control prevented me from complying with this expressed wish. I am now able to make such a summary as will enable you to judge of the results which have been reached during the past six years. This period is too brief to form a complete estimate of the work which is in progress; but it is long enough to show the principles which are here in operation and to indicate their tendency. It may be said of us, using the words of a recent writer in another connection, that the university has passed "out of the stage of prospectus into the stage of existence." It is a living force, attracting the attention of scholars far and wide, drawing students from almost every part of the Union, and visited frequently by observers of educational progress from foreign lands.

We have continually kept in mind that the principal object of this university is to educate

young men, and to certify to their attainments by careful examination and the bestowal of academic honors. In order that they may be well taught, instructors have been chosen who were already renowned, or who gave promise of marked distinction in the departments to which they were devoted. Consequently the academic staff is made up of men whose early training has been very different, and who bring to bear upon our incipient plans the experience of time-honored institutions, European and American. These instructors have been encouraged to continue their own investigations and studies, and the requisite apparatus and books have been liberally provided. They have also had the means of publication; and they have contributed heartily, each in his own way, to the intellectual activity of the other educational institutions of Baltimore, whenever invited to do so.

But they have never lost sight of their chief duty to the university, the guidance, instruction, and inspiration of young men, by example and by lessons; and to this end they have freely employed the laboratory, the lecture, the recitation, the examination, and the private conference, according to the circumstances of each case, so that every youth coming here for his education might be assured of the best aid which we could give him in the development of his mental powers and the formation of his character.

Some of our students have been already trained in good colleges, and come to us for the advanced opportunities which are here provided, and others are of the usual college age seeking to lay solid foundations for their future special pursuits.

I have often called attention to the distinction which we are endeavoring to make between university education and collegiate training, both of which it is here our endeavor to promote. May I be excused for repeating some of the phrases hitherto used upon this subject, so important does it seem to reiterate these views until they are fully understood.

According to acknowledged precedents still rigidly followed in the old world, universities exercise these four distinct functions: they provide advanced instruction in the chief departments of literature and science, and usually, also, in one or more of the so-called learned professions; they encourage investigation and the publication of important researches; they confer degrees; and they establish laboratories and bring together all necessary apparatus such as books, instruments, works of art, and collections in natural history.

Collegiate instruction is properly introductory to university teaching; it is elementary, formal, and disciplinary. It is largely devoted to the training of the intellectual powers and the formation of habits of attention, acquisition, memory, and

judgment, while it stores the mind with the elements of knowledge. A university cannot thrive unless it is based upon a good collegiate system; and it may rightly encourage or establish a college, if needed, as an important department of its activity.

There is a legitimate distinction between the earlier and later phases of a liberal education—the stage of discipline and the stage of guidance, the period of rules, tasks, and control, preceding the period of stimulating and quickening inspiration; but there is no doubt that both methods of training are in some degree appropriate throughout the academic life. There are likewise two kinds of professors—those who are best fitted by their patient and exact habits of intellectual action, by their well-stored memories, and by their logical modes of expression, to drill the classes over which they are placed; and there are others who have a gift for investigation, who are acute in suggesting important questions to be settled, and ingenious in devising the proper methods of solution—who delight to apply the touch-stone of truth to every doctrine, and to carry the light of modern science into every field. Sometimes both sorts of power are found in one individual.

The disciplinary method of a college calls for men of high social, mental, moral, and religious character, for they are to be concerned in molding

the dispositions of young men, and in forming their habits at a critical period of life, when the parent begins to relax his authority and the youth has not learned to govern himself. It requires as professors those who were born to be teachers, who delight to act upon youthful minds, to inspire them with lofty motives, to train them by the best methods, to emancipate them from the slavery of sloth, to set before them noble examples, to cherish their faith. The lessons to be inculcated during a college course include obedience to recognized authority, the performance of appointed tasks, punctuality in meeting all engagements, and attention to physical development. To acquire knowledge, to master the arts of clear reasoning and fit expression, to test the capacity for different kinds of intellectual exertion, to develop a desire to master difficulties, and to form intellectual friendships and associations, are among the ends to be sought in a college life. Such discipline implies but little freedom; but restraints, if wisely adjusted, are found to be as welcome to the scholar as they are to the athlete.

University methods, assuming that the students have already received this earlier discipline, that they are in earnest in the acquisition of knowledge, and that their characters are nearly formed, require less rigid processes of education. Opportunities, advantages, assistance are freely provided, but the

benefit derived from them must depend upon the individual. He may fail of his degree at the end of his course, but his daily deficiencies will not be charged against him. He may forfeit the confidence of his teachers, or even his membership in the university; he may fail to equip himself for his chosen career; but he can not be forced to learn his lesson or be brought under daily examinations. He must meet, as he does in life, the rewards of his own conduct. Nor will he be kept back by the neglect or dullness of his comrades. The fleetest of foot may travel as he will, without being hindered by those who are fettered. If the student have talents, or the rarer gift of genius, he may learn how to cultivate his powers most advantageously. He will find ready introduction to the writings of those who have been leaders of ancient and modern thought; he will have access to new and costly instruments of investigation; he may aspire to the attainment of a lofty ideal, sure of appreciative counsel from those who know the difficulties and the snares of an intellectual life; he may readily become acquainted with the state and tendency of science in every part of the world, and thus may be trained to make his own contributions to the progress of knowledge and the welfare of mankind. Teachers free from the routine of collegiate instruction, may be most serviceable in

the prosecution of scientific research, and most capable of giving aid to those who are already strong enough to walk alone. There is a sense in which it is true that the best of all teachers is the original investigator. His methods are not adapted to beginners. His followers may be few. But if his mind is endowed with rare qualities which have been assiduously cultivated under favorable circumstances, he will exert a powerful influence upon those who are able to follow him; he will incite his fellow teachers to constant activity; he will draw around him other superior minds; he will bring enduring renown to the university of which he is a member.

Our college work, I am glad to say, begins to be well understood and rightly valued by the people of Baltimore. The number of professional men, for example, clergymen, lawyers, and physicians, who know exactly what a good education should be, and who are now entrusting their sons to our training, is so large as to be very gratifying, and to make us, if possible, more eager than ever to maintain such methods and uphold such standards as experience shows to be the best. We appreciate the reasons why a distant college may be attractive to the youth of the city, but it is our aim to give all who come to us certain peculiar advantages, which they cannot find elsewhere. We have not adopted the plan of bringing

students together in dormitories or at a common table, for we have seen that home life, or that which approaches as nearly as possible to home life, has its own counterbalancing advantages, and that the protective and liberalizing influences of a large city may be conducive to the intellectual and moral development, as well as to the social culture of young men engaged in college work.

To undergraduate as well as graduate students Baltimore presents many special attractions. The cost of lodging and board in excellent private families is moderate. Those who are willing to go a mile or more from our buildings, may find dwelling places at low prices, readily accessible by the horse cars. The libraries of Baltimore, the Peabody, the Historical, and the Mercantile, are excellent, and constantly increasing. The Pratt library will soon be added to the number. The classical concerts of the Peabody conservatory of music are sustained every winter by skilful masters, with the aid of a generous fund. Annual courses of public lectures on the Peabody and Hopkins foundations afford an opportunity to hear the best speakers. There are parks and gymnasiums for recreation and exercise. The religious opinions of all are respected, and churches of every denomination are to be found in the city. Washington may be reached by express trains in an hour. The various libraries and

scientific establishments of the national government may readily be visited, and the work of the legislative, judicial, and executive departments of the capital may incidentally be observed.

A careful review of the opportunities in Baltimore for collegiate education was written last spring, and is appended to this report. I wish it might be read by all the parents in this community who may desire to give their sons a liberal education. I wish it might incite more young men in this large city to avail themselves of the great advantages here offered.

The Johns Hopkins University is an unsectarian foundation. Like the city in which it is placed, it includes among its members those whose opinions and beliefs are widely divergent. But it is not an irreligious foundation because it assumes no distinctive name. It inculcates the love of truth, not only in the daily relations of man to man, but in the defence of opinions, in the prosecution of research, and in the formation of mental habits. It insists upon uprightness of conduct in all its members. Yet in accordance with the usages of other well known colleges, which commonly bear denominational names, it lays down no test or creed for the assent of students or professors. The trustees have expressed a desire to see the university pervaded by a spirit of enlightened Christianity; the ethics taught is Christian ethics; the daily religious

service is Christian worship; but it is obviously inexpedient for the university to become identified with any one religious body. The abundance and diversity of churches in this community is such, that while our officers and students are of many denominations, they are able to maintain the relations which their own consciences approve.

The character, aim, and influence of the university foundation must be discovered in the conduct and utterances of those who administer its affairs, and by its results in a course of years.

NUMERICAL STATEMENTS.

During the year now closing, the interior work of the university has been as successful as ever. Classes have been taught in the various branches of higher mathematics, in chemistry and mineralogy, physics, biology, (including physiology and comparative anatomy); in history, political economy, ethics, logic, and psychology; in Greek, Latin, Hebrew, Sanskrit, French, Italian, Spanish, German, Anglo-Saxon and English. Twenty-four young men completing their courses of study, and passing the requisite examinations, have come forward to take their degrees. Good order, devotion to study, and enthusiasm in literary and scientific pursuits, have characterised the older and younger

scholars. A larger number than usual have matriculated, and an abundance of openings have been ready for those who were prepared to begin an active career.

The academic staff included during the year forty-three teachers, seven of whom were non-resident lecturers. In addition to this staff, five professors, not otherwise connected with the university, acted as examiners in particular subjects where their judgment was sought. The number of students enrolled during the year was one hundred and seventy-five, of whom ninety-seven were residents of Maryland, and sixty-eight came here from twenty-one States of the Union, and ten from foreign countries. Among the students were ninety-nine already graduated, coming from fifty-two colleges and universities; there were forty-five matriculates, (or candidates for the degree of bachelor of arts), and there were thirty-one admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The daily attendance upon eighty-three public lectures was one hundred and thirty-seven,—ascertained by the count of the door-keeper. The number registered at the opening of the present academic year is one hundred and ninety-two, of whom one hundred and ten are graduate students.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non-Matriculates.	Total Enrolled.	Average Attendance at Public Lectures.
1876–77	54	12	23	89	60
1877–78	58	24	22	104	84
1878–79	63	25	35	123	96
1879–80	79	32	48	159	113
1880–81	102	37	37	176	186
1881–82	99	45	31	175	137
*1882–83	110	49	33	192	

*As shown by the preliminary list at the opening of the academic year.

The attendance upon some of the principal courses during the last four years has been as follows:

	1878–79.	1879–80.	1880–81.	1881–82.
Mathematics, ...	38	31	31	33
Physics, ...	32	38	35	42
Chemistry, ...	39	46	40	44
Biology, ...	26	32	25	32
Greek, ...	40	36	31	33
Latin, ...	27	40	40	39
German, ...	55	60	55	47
French, Italian, etc. .	18	39	33	26
English, ...	*	19	20	22
History, etc.	19	33	40	40
Logic, ...	6	16	13	9
Philosophy and Ethics,	6	12	14	22

* Not recorded.

Looking over our register for the last six years, it appears that four hundred and forty-nine individuals have been here enrolled as students, of whom two hundred and fifty-one have come from Maryland, (including two hundred and four from Baltimore), and one hundred and ninety-eight from thirty-five other states and countries. Of this number two hundred and seventy-five persons pursued courses as graduate students and one hundred and seventy-four as collegiate students.

The university has become a sort of national seminary for the training of teachers, over one hundred of those here taught having become professors and instructors in colleges, academies, and schools. But this is not the only calling for which young men are prepared. Seventy-eight are physicians and students of medicine; thirty-one are clergymen and students of theology; twenty-nine are lawyers and students of law; forty-three are engaged in business (as chemists, engineers, electricians, manufacturers, merchants, etc.); and a few have entered the scientific service of the U. S. Government.

From these general remarks let me proceed to speak of each of the principal branches of study, and to exhibit, as far as I am able, the various steps by which we have reached our present position.

MATHEMATICS.

At the beginning of our academic life, Professor Sylvester, of London, accepted an invitation to the chair of mathematics, and he brought to our counsels long experience as a teacher and great renown as a writer and thinker. He was a member of the chief scientific societies of Great Britain and the Continent, and had received many academic honors. Since he came to Baltimore, the Royal Society of London has bestowed upon him its highest scientific distinction, the Copley Medal, and the University of Oxford has honored him with the degree of D. C. L. He has lectured annually to a company of advanced mathematicians, most of whom have been looking forward to professorships; he has established the American Journal of Mathematics; and has written many original memoirs, not only for his own journal, but for other scientific periodicals. He has also encouraged the preparation of valuable papers by several of his pupils.

At his suggestion, Professor Cayley, of the University of Cambridge, was invited to spend some months of the year just closed in Baltimore, and kindly consented to come and lecture alternately with Professor Sylvester to the same advanced students. His residence among us continued from January to June. His instruction during this period was heartily appreciated by the not incon-

siderable number who were capable of following his masterly lectures, and has given a permanent impulse to the studies of the university in the highest walks of mathematical science. The number of students following these two lecturers, was fourteen. Various brief courses on special advanced subjects were given during the same half-year by Messrs. Peirce, Story, and Craig.

Mr. W. E. Story, Ph. D., a Harvard graduate, who continued his studies in Leipsic for several years, was the first associate appointed in mathematics. Mr. Thomas Craig, Ph. D., a graduate of Lafayette College, who was one of the first persons elected to a fellowship among us, has also become an associate, giving up on this account advantageous appointments offered to him elsewhere. More recently, Mr. Fabian Franklin, Ph. D., after having been successively a student, a graduate, a fellow, and an assistant, has been promoted to the rank of associate.

The courses of lectures have varied annually, so that a student resident at the university during a term of three years, more or less, has had an opportunity to apply himself to many different mathematical subjects. Among the courses which have been given are the following:

Determinants and Modern Algebra (1876–79).
Theory of Numbers (1879–82).
Algebraical Geometry, in connection with the Abelian and Theta Functions (1882).
Clebsch-Gordan Invariantive Theory (1882).

Construction and Dissection of a Riemann's Surface (1882).
New Theory of Universal Multiple Algebra (1882).
Quaternions (1877–82).
Elliptic Functions (1878–80; 1881–82).
Higher Plane Curves, Advanced Course (1880–82).
Solid Analytic Geometry (1878–82).
Total Differential Equations (1877–82).
Partial Differential Equations (1880–82).
Calculus of Variations (1879–80; 1881–82).
Spherical Harmonics (1878–80; 1881–82).
Cylindric or Bessel's Functions (1879–80).
General Theory of Functions, including Riemann's Theory (1879–81).
Definite Integrals (1876–77).
Determinants (1880–81).
Modern Algebra (1880–82).
Higher Plane Curves, Elementary Course (1878–82).
Theory of Equations (1876–82).
Differential and Integral Calculus (1876–82).
Conic Sections (1876–82).
Modern Synthetic Geometry (1877–78).
Gauss's *Theoria Motus* (1877–78).
Theoretical Mechanics (1877–82).
Mathematical Theory of Elasticity (1876–78; 1881-82).
Hydrodynamics (1879–81).

Lectures have also been delivered in allied departments on Mathematical Physics, and on Mathematical Logic.

The instructors and more advanced students in mathematics have held monthly meetings under the presidency of Professor Sylvester, assisted by Dr. Story, as a mathematical seminary, which constitutes in fact the mathematical society of the university. During the last three years, papers on the following subjects have been presented and discussed:

CAYLEY, A. Two cases of the quadric transformation between two planes; a problem of analytical geometry; a geometrical representation of an equation between two variables; associative imaginaries; formulæ of trigonometry.

CRAIG, T. Proof of Abel's theorem; a geometrical theorem; areas of corresponding surfaces; note on an n-fold potential.

DAVIS, E. W. Binodal quartics.

DURFEE, W. P. Properties of the numerical solutions of $ax^2 - y^2 = -1$.

ELY, G. S. Partitions; note on the determination of the number of the even and of the odd integer roots of an equation.

FRANKLIN, F. A deduction from the properties of a system of three circles; v. Gall's table of groundforms for the octavic; new proof of Euler's development of the infinite product $(1-x)(1-x^2)(1-x^3)\ldots$; notes on Newton's method of approximation, etc.; a class of differential equations; probability of the existence of an error in the result of a certain computation; cubic curves; cubics and systems of conics.

HATHAWAY, A. S. Generalized forms of trigonometrical ratios; general method in congruences and its application to the theory of the divisors of cyclotomic functions of every class; similarity between congruences and equations and its significance; cyclotomic functions, considered with respect to a prime modulus p; modular functions.

MITCHELL, O. H. Completion of Fermat's theorem; binomial congruences; completion of Wilson's theorem, and the number of nth residues; properties of the roots of $x^2 \equiv x \bmod. k$; theorem including Fermat's and Wilson's theorems; binomial congruences (mod. $p, f(x)$); residues of symmetric functions; partitions; determinants of powers.

PEIRCE, C. S. Relative forms of quaternions; proof that there are only three linear associative algebras in which division is an unambiguous process.

PERRY, H. M. Rule of signs in determinants; singular solutions.

PRENTISS, R. W. Problem in maxima and minima; a geometric locus.

STORY, W. E. Generalized form of analytical triangle; volumes and surfaces of n-dimensional spheres; two kinds of k-th totients; notation for totients; system of conchordal conics; analytical proof of some properties of binodal quartics; non-Euclidean trigonometry; outline of Clebsch & Gordan's method of finding the ground forms of a binary quartic.

STRINGHAM, W. I. Vector ratios considered as trigonometric functions of angles; rotation in four-dimensional space.

SYLVESTER, J. J. Triangles in- and ex-scribable to a general cubic curve; resultant of two congruences; prerogative of a ternary denominational system of coinage; multisection of the roots of unity; certain integrable class of differential and finite-difference equations; completion of the author's method of obtaining the groundforms to any binary quantic or system of binary quantics; question in partitions; geometrical proof of a theorem in numbers; geomet-

rical treatment of a theorem in numbers; properties of a split matrix; nonions; mechanical involution.

VAN VELZER, C. A. On a condition that the total differential equation $Pdx + Qdy + Rdz + \ldots + Tdv = 0$ may admit of a single primitive; certain compound determinants.

PHYSICS.

Early in 1875, Mr. H. A. Rowland, then of the Rensselaer Polytechnic School in Troy, whose papers on magnetic distribution and permeability had already attracted the attention of Clerk Maxwell and other physicists, was called to the service of this university and encouraged to go abroad for the purpose of visiting new physical laboratories and of purchasing instruments. He was subsequently chosen professor of physics, and has since lectured annually to advanced students on heat, electricity, and magnetism. He has also been responsible for the guidance of their laboratory work. Professor Rowland has had great facilities for the prosecution of original researches and has justified in this respect the confidence reposed in him. His attention was first directed to a determination of the absolute value of the ohm. He soon afterwards proceeded to a re-determination, by a method of his own, of the mechanical equivalent of heat. The experiment was conducted in part at the cost of the Rumford fund of the American Academy, and the results

were published in the proceedings of that society. The historical study of this subject was communicated to the Institution of Science, Letters and Arts, in Venice, in response to their offer of a prize,—and it received from this society the premium of fifteen hundred lire. Recently, Professor Rowland has been engaged in the analysis of the solar spectrum. He devised an instrument for the ruling of "gratings," which give better results in spectrum analysis than have ever before been reached. The photographs of the spectrum thus obtained are most noteworthy. By making these gratings on concave surfaces, a new and very accurate method of comparing wave lengths has been obtained. The particulars of this advance in physics have been described in a recent number of the Circulars, and more will soon be published in regard to them.

It should here, perhaps, be mentioned that at the request of the State Department, Professor Rowland attended as a delegate the International Congress of Electricians held in Paris, in the summer of 1881, and was made a member of an International Commission on Electric Standards.

To the position of associate in physics, Mr. C. S. Hastings, Ph. D., once of the Sheffield Scientific School, and later, the holder of a Tyndall scholarship, was invited. He has given annually the course in general physics, taking up in lec-

tures and exercises the subjects of mechanics, light, heat, electricity, magnetism, etc. He has had excellent apparatus at command for demonstration in addition to that provided for investigation. Dr. Hastings has also carried forward a long and careful study of the astronomical objective, for the purpose of discovering the theory by which such a lens should be constructed. He has recently made three lenses according to the theory which he had worked out, and they have been pronounced satisfactory in a high degree. Dr. Hastings has also given much attention to astronomical physics, and has had a private observatory in which he has observed celestial phenomena. He has also lectured from time to time on this class of subjects, one such course having been given by request to a select company of astronomers in Washington, at the Smithsonian Institution. These gentlemen subsequently addressed a letter to the trustees, indicating the profit they had derived from his lectures, and especially from that part of them which related to the improvement of the telescope.

In 1879–80, an investigation of an action, hitherto unobserved, of the magnet on electric currents was carried on by Mr. E. H. Hall, then a fellow, at the instance of Professor Rowland.

The physical apparatus is new and good. A very large number of instruments intended for

research have been bought of the makers, and others have been manufactured here by Mr. Schneider, the mechanician of the university, whose skill is deserving of much commendation. Others have been bought for the purpose of illustrating the general course of lectures, and others again for the use of properly qualified students who wish to become familiar with the exact methods of physical inquiry. It is unfortunate that this costly apparatus is not more conveniently arranged, and that better rooms are not provided for the delicate investigations which are in progress. One of our most pressing wants at the present time is a good building for the physical laboratory. Such buildings are not common in this country, but their importance is so obvious that generous individuals have recently given large sums for their construction at Cambridge and New Haven; and within a very short time we may expect to see the colleges in both those places better equipped than we are for the study of physics, unless indeed the trustees of this foundation see the way clear to build such a laboratory in Baltimore.

There seems to be a special demand at this time for trained physicists, and the students of this department have been called to good positions quite as soon as they were ready to go.

CHEMISTRY.

Professor Remsen, then of Williams College, Mass., was invited to the chair of chemistry in 1876, and a laboratory was immediately built under his direction, adapted to the needs of about forty chemists. More than that number of students have recently sought admission at the same time, and the laboratory is consequently being enlarged to a much greater capacity. Dr. Remsen has given the annual course in general chemistry, an annual course in organic chemistry, besides other advanced courses on thermo-chemistry and the history of chemistry. He has, further, directed the practical work of the students.

Ever since the organization of the laboratory, researches in various directions have been carried on constantly, the results of which have appeared in the American Chemical Journal and the principal foreign journals of chemistry. The main line of investigation has followed a group of phenomena observed in oxidizing the substitution-products of the so-called aromatic hydrocarbons. A law of wide application governing these phenomena has been discovered, and other results of value have been obtained. While the substances which have formed the special subjects of the studies are themselves not familiar to laymen, the principle established is applicable to familiar facts, throwing much needed light upon them.

Among many incidental services which have been rendered to the public by our chemists, the most noteworthy has been a study of the drinking waters of Baltimore, which was undertaken at the request of the civil authorities, to ascertain the cause of the so-called *cucumber*-taste, at certain times quite disagreeable. Professor Remsen showed conclusively that many supposed causes of this taste were not real. His investigation allayed much anxiety on the matter, and led to his being invited by the civil authorities of Boston to make a like investigation in and near that city. Here he was so fortunate as to discover that contamination in one of the sources of supply, was due to the presence of a fresh water sponge, *spongilla lacustris.* Under the auspices of the National Board of Health, Professor Remsen has investigated the subjects of "organic matter in the air," and "carbonic oxide as a source of danger in apartments heated by cast-iron stoves and furnaces." He had also begun a complete investigation of the question of water contamination by sponges, but the failure of Congressional appropriations has, at least temporarily, put an end to this work.

The establishment of the American Chemical Journal is referred to on a later page.

The associate, Mr. H. N. Morse, Ph. D., once of Amherst College, has given a part of the lectures, and has had constant oversight of the

laboratory. Recently he has begun to give instruction also in mineralogy, and has been quite successful in building up the cabinet of minerals. George T. Marye, Esq., of San Francisco, is making constant and generous additions to this collection, illustrating the mineral wealth of the Pacific States, and his contributions are to be brought to us across the continent, without charge, by the liberality of Messrs. Wells, Fargo & Co., and the Adams Express Company.

Some of the students of the chemical laboratory have gone into business pursuits; others are engaged as professors and teachers.

BIOLOGY.

As we looked forward to the time when the study of medicine would be especially promoted in this university, in connection with the hospital founded by Johns Hopkins, attention was given in our earliest plans to the study of the biological sciences, in order that young students expecting ultimately to become physicians and surgeons, might receive in the preceding collegiate course, the most suitable training for their useful and difficult calling.

The medical department of the university is not yet organized, but a very considerable number of students have been here taught physiology and morphology, by the methods of modern biological

science, and have gone from among us to professional schools. Many resident physicians have also availed themselves of the opportunities here afforded to become acquainted with the most recent advances in these branches of science.

The head of the biological department is Professor Martin, a graduate of the University of London, and of the University of Cambridge, and he has directed his attention chiefly to the science of physiology. Dr. W. K. Brooks, from the Museum of Comparative Zoölogy, Cambridge, Mass., has been from the beginning an associate in biology, and has given instruction in animal embryology and morphology. There have been other excellent adjuncts in the biological staff, all promoted after prolonged studies among us, namely, Messrs. Sewall, Clarke, Sihler, Councilman, Sedgwick, and Wilson.

The course of studies recommended to students who expect to become physicians, (quite distinct from and antecedent to the strictly professional study of medicine, but quite as essential in these days to the liberal education of a medical man), is made up of physics, chemistry, and biology, with the addition of Latin, mathematics, psychology, and English literature, and with at least sufficient knowledge of German and French for the perusal of scientific works which are written in those languages. It was somewhat of a surprise to us that

the announcement of such a course should at first be received with hesitation by those who were in a position to judge of it, but we were soon informed that this hesitation was due to a lack of acquaintance with the purpose we had in view, and likewise to some quite secondary and perhaps infelicitous phrases which were employed in the original announcements. We were presently confirmed in the course we had adopted by the very encouraging letters received from a number of eminent physicians in Great Britain, several of whom had long been familiar with the professional schools of England, Scotland, and Ireland. These letters were not in a form for publication, but they contained many valuable comments which were of service to the authorities of the university.

The following statement has been written by Dr. Martin, to show the character of the course in biology recommended to undergraduates:

"Among the subjects which students may take up after studying physics and chemistry, is biology, and this study is recommended to those who are preparing themselves to enter at a later period upon the professional study of medicine.

"When the undergraduate enters the biological laboratory, he does not at once begin the study of botany or zoölogy, or any subdivision of these, but gives attention during the first year to general biology—to acquiring a general knowledge of the forms assumed and the properties exhibited by living matter. For this purpose the student commences with the study of unicellular organisms; is next carried on through a series of types selected from the higher fungi, the cryptogamous, and the flowering plants; and is finally made to examine thoroughly a specimen from each class in the animal kingdom. These types form the texts for lectures and recitations upon general biological laws and the phenomena which they are selected to illustrate; but the main work is done

in the laboratory, so that the instruction has a firm practical basis, and the various technical terms are made intelligible through their illustration by the observations of the student himself. Having formed a good acquaintance with a number of adult forms the student next takes up *embryology*, the lectures on which are illustrated by a thorough practical study of the development of the chick, and a less extensive one of the developmental histories of some other animals. During this preliminary course the student also, with the aid of a selected series of skeletons, studies the main facts in human and comparative osteology. After its completion some specialization of study is permitted, and the more advanced a student is the more is this encouraged. In the next year, if he intends afterwards to enter a medical school, he takes up the study of animal physiology and histology; and also dissects one of the higher mammalia (dog or cat) with minuteness and care, and attends a short course of lectures on comparative anatomy. Students who do not look forward to becoming practitioners of medicine, may select animal morphology for special study in the second year of the biological course, in preference to animal physiology. Definite arrangements for the prosecution of botanical studies beyond the point to which they are carried in the first year of the biological course, have not yet been made.

"This undergraduate course, while primarily designed as a stepping stone for those who intend to become biologists, is at the same time complete in itself, and believed to be the form of biological instruction best adapted for those who do not expect to become either botanists, zoölogists, or physiologists, but who desire to acquire some knowledge of the methods and ideas of modern biology, as one of the branches of general culture which they select among the studies leading to the baccalaureate degree."

I should be wrong if I gave the impression that the biological work of the university has been only directed to the training of future medical students. It has afforded instruction to several undergraduates of the university who selected biology as one of the subjects in which to stand examination for the B. A. degree, but who had no intention of ever studying medicine; and it has also been concerned in important researches, the results of which have been published in the Journal of Physiology, of which Dr. Michael Foster, of the University of

Cambridge, is the editor, and in Studies from the Johns Hopkins Biological Laboratory, edited by Professor Martin and Dr. Brooks; also in various other scientific periodicals, and in the transactions of learned societies.

As regards post graduate work in physiology the following statement has already been published:

"The relations of the university to the hospital seemed from the first to indicate animal physiology as a subject having special claims on us, and this opinion was confirmed by a consideration of the present status of that science in this country. Notwithstanding a small number of brilliant physiological discoveries made in the United States, and the fact that several distinguished physiological investigators are found here, it can hardly be said that America has taken her fair part in contributing to the modern advance of physiology. The costliness and variety of the accurate instruments required for modern physiological research almost preclude any but a well-endowed institution from obtaining them; hence the majority of medical students, even had they time, have not the opportunity of acquiring that practical knowledge of the methods of physiological inquiry which is so valuable an auxiliary in those therapeutical and pathological researches, which, conducted on the modern experimental method, have added so much in late years to the list of remedial agents at the disposal of the practising physician. Numerous good teachers do, no doubt, give instruction concerning those main facts already acquired which it is essential for the practitioner to know, but it seemed important to introduce a graduate course to train men as specialists in physiology, so that they might not only be qualified to teach it, but to add to our knowledge of the working of the living body, and to supply new facts for the physician to utilize. While chemistry has made good its position as a science which, though essential to those who practice medicine, has claim to a place in the circle of sciences apart from that or any other immediate practical application, physiology has only recently begun to advance into that fortunate position and to be pursued for its own sake, as it now is in many European countries; as yet in the United States it is but little studied, except in immediate connection with a medical curriculum. Manifold experience has, however, showed that a science rarely makes important advances when pursued merely as a means to some specific end to which it is made secondary; and as modern advances in the investigation of the action of drugs and in the comprehension of pathological phenomena are more and more arrived at by reasonings based on physiological results, and by experiments carried on by

physiological methods, the time seems to have arrived when, at least in certain centres, physiology should be made a subject of independent study.

"For the reasons briefly stated above, animal physiology has formed one of the subjects for special advanced study selected by the Johns Hopkins University; and of its subdivisions, more attention is given to what is commonly known as "experimental" than to "chemical" physiology, the latter being already fairly well provided for in several colleges. Of animal histology the same may be said. Therefore, while arrangements were made to enable any student to verify for himself the main points established in animal chemistry and histology, the chief endeavor has been to provide special facilities in the so-called experimental physiology, and the instruments brought together for advanced study and research in that branch of knowledge are believed to be more numerous and to cover a wider ground than those to be found elsewhere in this country. The laboratory is conveniently arranged for advanced work, the rooms occupied by those engaged in it being shut off from the general laboratory fitted up for the junior students.

"As to the method of selecting instruments the following statements may be of interest. Before the opening of the university the trustees placed at the disposal of Professor Martin, to whom was entrusted the organization of the biological department, a considerable sum, which was mainly expended in procuring the instruments and appliances essential for the various branches of undergraduate biological work. For instance, a number of microscopes were purchased, so that each student should have one for his own use; also the apparatus necessary to enable every one to repeat for himself, (as he is required to do when pain to an animal is not involved,) the more easy physiological experiments, and the apparatus necessary for the demonstration of such fundamental physiological facts as are too difficult for the less advanced students to carry out for themselves. Since that time the trustees have yearly provided $1,000 for the purchase of new instruments; of these some are selected from those which have been described within the preceding twelve months and seem of value, or which, though older, are of general usefulness in the laboratory; the remainder are purchased for the execution of special investigations, so that, within reasonable limits as to cost, any one engaged in a research can have purchased or constructed for him such instruments as he may require. The collection of apparatus is, therefore, somewhat unique; starting with the general outfit of a physiological laboratory, and growing by the constant addition of the more frequently useful instruments for demonstration and class-work, it also contains many pieces of apparatus which were ordered for special ends; and both groups are added to yearly.

"A competent mechanic, at work on the premises, constructs some of the new apparatus, and also, which is more important, is always at hand for the immediate repair of any instrument which may get out of order."

With reference to the graduate instruction in zoölogy and comparative anatomy, another extract from the published announcements may here be given.

"The next question for consideration was what should be done to promote graduate study in zoölogy and comparative anatomy. Here again the best principle to adopt seemed to be, after arranging to give the ordinary undergraduate instruction as well as to provide the more essential appliances for advanced work in all branches of zoölogy, to select for special effort and encouragement the subdivision which should appear to be least commonly or efficiently promoted elsewhere.

"Facilities for advanced work in systematic zoölogy were already well provided in many educational institutions and also in connection with the national coast and territorial surveys, and the national and State fish commissions. Of comparative anatomy, so far as adult forms are concerned, almost the same may be said; but, with some well known exceptions, the study of the development of individual animals, considered in connection with problems of general animal morphology, has received less attention, although the American fauna affords many unique opportunities, and it is now generally believed that all scientific systems for the classification of animals and the recognition of homologies in the organs of different species, genera, and classes, must be mainly based on the study of the developmental histories of individuals.

"The university has accordingly not undertaken the formation of any extensive museum; such typical specimens are provided as are requisite for the satisfactory instruction of ordinary students of zoölogy, but there has been no attempt to bring together a vast collection such as specialists in systematic zoölogy require for their work. Such collections are found in several other educational centres, and, therefore, in accordance with the general principles of the university, were not considered as of primary importance here; while the fact that the national collections at Washington are within easy reach of persons residing in Baltimore should any point needing reference to a large museum arise, made it possible for the present to postpone the founding of a museum of natural history. Whether the university will ever undertake this task is a question for future decision. No doubt ready access to an extensive collection is of vast importance to every zoölogist, a museum being to him very much what a great library is to the philologist. We may perhaps hope that what Peabody has done in founding a great reference library in Baltimore, which has freed the university trustees from the necessity of expending their income for that purpose, may some day be supplemented for the biologists through the endowment by some citizen of a natural history museum, the organization of which shall be entrusted to experts, so that,

while a source of recreation and instruction to the general public, it shall also be available for scientific work."

As an aid to the study of morphology, besides the facilities afforded in our biological rooms, a marine station for zoölogical research has been maintained upon the seaboard during the last five years. The only opportunities before provided for thorough study of marine zoölogy upon the thousands of miles of sea coast of the United States have been those afforded by the private laboratory of Mr. Alexander Agassiz at Newport, and that of the United States Fish Commissioners at Wood's Holl, under Professor Baird; and before the opening of the Chesapeake Zoölogical Laboratory, the founding of a marine laboratory for advanced research had not been attempted in this country by any educational institution. The director of the station is Dr. W. K. Brooks, assisted during a part of the time by Mr. S. F. Clarke, Ph. D., now professor of natural history in Williams College, and more recently by Mr. E. B. Wilson, Ph. D. The results of each summer's studies have been or will be printed in full, in the appropriate journals. Three of them are, however, so important as to deserve particular mention here. Dr. Brooks's memoir on the development of *Lucifer* was accepted by the Royal Society of London, and has just been published in a quarto volume of 80 pages, illustrated by

eleven plates. Dr. Wilson's memoir on *Renilla*, an elaborate monograph, likewise illustrated by numerous careful drawings, is now ready to be printed. Dr. Brooks's study of the *Oyster* has attracted very wide attention. He began this investigation from a point of view purely scientific, determined to observe and if possible to discover the laws which govern the reproduction of this mollusk. The results of his enquiry were printed in 1880, and widely distributed. His success was so remarkable that it was honored by a medal from the *Société d'acclimatation* in Paris, and has led to repeated requests that he would continue his investigation and endeavor to discover the causes which are rapidly destroying the oyster beds of the Chesapeake. With the hearty concurrence of the trustees, Dr. Brooks has accepted a place on the oyster commission appointed by the Governor of Maryland, and during the next few months, he will, with his colleagues, make further researches upon a question which is as interesting from an economic as a scientific point of view. Dr. Brooks has also rendered important scientific counsel in respect to the management of an aquarium to be established in Baltimore, by John W. Garrett, Esq., for public entertainment and instruction in natural history.

The rooms devoted to biological work have been from time to time increased, but the accommodations are still so inadequate that the trustees have

begun the construction of a new building to be entirely devoted to this study, and Dr. Martin has just returned from Europe, able to bring into service among us the latest suggestions of kindred institutions abroad. Liberal appropriations for the purchase of apparatus have always been made by the trustees. The collections of specimens are such as are needed by students among us.

Among the noteworthy discoveries which have been made in the biological laboratory may be mentioned that of a new method of studying the physiology of the mammalian heart, devised by Dr. Martin. By this method the heart of a warm blooded animal is kept alive after the death of all the rest of the creature; the direct influence of various conditions and of different drugs upon it can accordingly be studied with an accuracy previously quite unattainable, the influence of the nervous system and of other organs of the body upon the heart being eliminated. Hitherto, only the hearts of cold blooded animals have been available for physiological, pathological, and therapeutical study in this isolated condition; and for obvious reasons deductions as to the functions of the human heart, drawn from the study of the so different hearts of frogs and turtles, were open to many objections. Some first fruits of this inquiry have been communicated to the Medical and Chirurgical Faculty of Maryland, by Professor Martin, and by

his associates and scholars, Messrs. Sewall, Sedgwick, Howell, H. H., and F. Donaldson, and Warfield, and have been printed. Dr. Martin, recognizing the co-operation of his staff of adjuncts, proposed to call this important mode of inquiry the "Baltimore method." To utilise it in the thorough study of cardiac physiology will supply abundant work for many hands for several years, numerous problems which have hitherto been unattacked being now rendered available for investigation.

In addition to the papers published in the biological studies, attention should be called to a manual of human physiology, prepared by Dr. Martin, entitled "The Human Body"; to a hand-book of invertebrate zoölogy, prepared by Dr. Brooks for the scientific student at the sea-shore; and to a manual on the anatomy of one of the chelonia, (the slider-terrapin), by Dr. Martin and Dr. W. A. Moale, being the first part of a hand-book of vertebrate dissection, for use in biological laboratories. A school edition of "The Human Body" is now in type, as is also the second part (how to dissect a bird) of the hand-book of vertebrate dissection.

ANCIENT AND MODERN LANGUAGES.

As a leader in classical philology, Professor Gildersleeve was called here from the University of Virginia, where he had long been the professor of

Greek, and had acted for several years as professor of Latin. He declined to be responsible for the instruction in Latin, and concentrated his force upon Greek, with the purpose of giving to students, who propose to become teachers, and others, an opportunity to pursue their studies beyond the ordinary classical curriculum. At an early day he found it convenient to employ some of the methods which are used in the seminaries of German universities, and engage with his class in the prosecution of special inquiries bearing upon some central theme.

The work of the seminary in successive years has been as follows:

In 1878–79, the exercises included the analysis, exegesis, and criticism of selected tracts of Lucian, and the prosecution of researches into the language of Lucian and the life of the second century, such as Lucian's relation to Herodotus, the Ionism of the *Dea Syria* and the *De Astrologia*, the use of the optative in Lucian, Lucian and Diogenes Laertius, traditions as to the oriental origin of Greek philosophy, the worship of the Syrian Goddess, Lucian's attitude toward religion, and Lucian as a student of art.

In 1879–80, the centre of work was Aristophanes, and the play selected for special study was the *Wasps*. The members of the seminary were required to present in turn an exegetical and critical commentary of a portion of this comedy, and this work constituted a regular weekly exercise. In order to secure a wider knowledge of the author, cursory readings were also instituted in the other plays, which were in like manner assigned to certain students, charged with the duty of preparing the historical introduction and the analysis. In this way nearly all the members were made acquainted with the bulk of Aristophanes, and some of them followed besides a course of study in the fragments of the comic poets. Among the more elaborate papers, which were the fruit of this work in Aristophanes, may be mentioned the following: On the tropology of Aristophanes; on the genitive case in Aristophanes; on the infinitive in Aristophanes; on the distribution of the *choreutai* in the *Wasps*.

In 1880-81, the seminary was mainly engaged in the study of the Attic orators, especial attention being paid to the development of language and style and to the antique canons of æsthetic criticism. The members were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to prepare historical introductions, to make analyses of speeches and abstracts of rhetorical treatises. Parts of Antiphon, Andokides, Lysias, Isokrates, Isaios, and Demosthenes were studied in this way, and some of the minor orations of the four last named were compared with one another in connection with the *iudicia* of Dionysios of Halikarnassos. Besides this general work, subjects of special study in the orators were assigned to individual members of the seminary and an effort was made to insure a personal acquaintance on the part of all the students with the works of all the orators of the Attic canon. Introductory lectures, informal examinations, and conferences were also held by the Director at suitable points in the course. Of the investigations which were carried on may be noted: Studies on the nominal periphrases for the verb in Antiphon and Thukydides; on the genuineness of the first Antiphontean oration; on synonyms in Antiphon; on the use of the locative formations, of *πρίν*, and of *ἐπί* in the orators; an elaborate statistic of certain syntactical characteristics of Andokides; an inquiry into the influence of technical rhetoric on the *ῥήσεις* of the Attic drama. Special work was also done in Isaios, Lykurgos, and Deinarchos.

In 1881-82, the centre of work was Plato, chiefly with reference to the literary form. In the seminary proper, the *Euthydemos* and the *Theaitetos* were interpreted by the members in turn, with analyses and introductions and the *Symposion*, *Republic*, and *Protagoras* were analyzed. Papers were presented, read, and discussed on the *Euthyphron*, on the aim and result of the *Theaitetos*, on Dionysios' criticism of the style of Plato. Studies were made in. Platonic syntax and on the relation between the discourses of Socrates in the *Symposion* and in the *Phaidros*. Some work growing out of the studies of the preceding seminary year was completed, such as an exhibit of the use of the so-called genitive absolute in the orators. A study on *ἐπί* in the orators, begun the preceding year, was extended to Homer and Plato, and in continuation of a line of syntactical investigations opened several years since by the director, statistics of the articular infinitive in Xenophon and Plato were prepared by members of the seminary. The results of some of these investigations will be prepared for publication. A survey of Homeric comparisons grew out of the consideration of the comparison in Plato, which was the theme of an earlier seminary essay. Professor Goodwin, of Harvard University, conducted the seminary for one meeting, in order to prepare the members for his presentation of the *Line* and the *Cave* in the *Republic*.

The establishment of the American Journal of Philology, under the editorial care of Professor

Gildersleeve, is mentioned in another place. His four courses of public lectures on Greek lyric poetry, on Homer's Odyssey, on Greek prose literature, and on the Greek tragic poets, were admirably adapted to awaken and keep up the love of classical literature among all who heard him.

The university is co-operating with several other institutions in the encouragement of Americans to engage in archæological investigations at Athens, under the auspices of the American Archæological Institute, Professor Goodwin being the present director.

In order that the classical instruction of undergraduate students might be carried forward in the most efficient way, the services were engaged of Professor Charles D. Morris, a graduate of the University of Oxford, and a former fellow of Oriel. He had already acquired a reputation in this country by his text-books, and by his remarkable success as a teacher. Upon him to a very large extent has devolved the instruction of matriculated students in the Latin and Greek classics. In this work assistance has been rendered in successive years by Mr. John M. Cross, of Baltimore, a graduate of Princeton, who also acted as registrar during our opening year, Mr. G. F. Nicolassen, Ph. D., and Mr. E. H. Spieker, Ph. D. Mr. J. F. Jameson, Ph. D., has been recently engaged to give instruction in classical history and geography.

The authors read in undergraduate classes have been these:

GREEK.		LATIN.	
Aeschylus.	Isocrates.	Catullus.	Persius.
Aristophanes.	Lyric Selections.	Cicero.	Plautus.
Aristotle.	Lysias.	Horace.	Pliny.
Demosthenes.	Plato.	Juvenal.	Quintilian.
Euripides.	Sophocles.	Livy.	Tacitus.
Herodotus.	Thucydides.	Lucretius.	Terence.
Homer.	Xenophon.		

In 1879, the university invited to its staff Mr. Minton Warren, a graduate of Tufts College, who had been resident in Germany for several years pursuing the study of Latin. Before coming to us he received the degree of Ph. D. from the University of Strassburg, having presented as his thesis, a paper on the enclitic *ne* in Early Latin. This appointment enabled the university to offer still further advantages for classical study. Dr. Warren has begun a Latin seminary, which was devoted, during the last winter, to the study of Virgil. The character of this work is indicated by the following paragraph:

A preliminary course of ten lectures was given on the ancient lives of Virgil, on the MSS., commentators, and scholia, and on Virgil's place in Roman literature. Occasional lectures were given during the year on various topics connected with Virgilian criticism. Special attention was paid to the syntax of Virgil and his influence upon subsequent writers, and to the development of the hexameter from Ennius down to Ovid. Some metrical statistics were collected by members of the seminary, and papers were read summing up recent views of Virgil's imitation of Greek poets, on his archaisms, and his value for the illustration of Roman antiquities. All of the Eclogues and Georgics were analyzed by the members in turn, and four of the Eclogues, the Episode of Aristaeus in Book IV of the Georgics, and portions of Books I, VI, and VIII, of the Aeneid were made the subject of critical interpretation.

Mr. C. R. Lanman, Ph. D., a former scholar of Professor Whitney, and subsequently a student of philology in Tübingen and Berlin, came to Baltimore as a fellow in 1876, and was soon promoted to the rank of an associate in Sanskrit. He gave instruction in this language and in comparative philology during three years, and was then called by the authorities of Harvard University to a corresponding professorship in Cambridge. While here, he was engaged in preparing an elaborate study on noun inflection in the Veda, which was printed by the American Oriental Society in a memoir of 276 octavo pages. After he resigned, the vacant position was offered to Mr. M. Bloomfield, Ph. D., who had been a pupil of Toy and Whitney, had resided for one year as a fellow in Baltimore, and had continued his studies in Germany. Dr. Bloomfield began his courses of instruction among us in 1881, and has already made several noteworthy contributions to philological science.

Instruction in the Semitic languages was given from 1876 to 1879 by Mr. Thomas C. Murray, who had prepared himself for this work by his studies under Ewald and Lagarde. After his death, some instruction in Hebrew was given by Mr. J. M. Cross, and at a later day Dr. Bloomfield consented temporarily to take charge of the class.

The instruction in German was given from 1876 to 1882 by Mr. H. C. G. Brandt, who has just resigned his position as an associate, to become, after a year's residence in Europe, professor of modern languages in Hamilton College, where he graduated and began his professional career. Mr. Brandt has not only been an efficient teacher of modern German, but he has encouraged the study of Teutonic philology by teaching Gothic, Old High German, and Middle High German. His resignation occasions much regret. Fortunately, Dr. Wood is able to assume the duties of Mr. Brandt, and consents to do so temporarily, with the promised co-operation of Professor Raddatz and Dr. J. W. Bright. Dr. W. H. Browne, our librarian, will relieve Dr. Wood of a part of his duties in the English department, and Dr. W. H. Carpenter will give a short course of lectures on Icelandic literature. These arrangements will enable the trustees to take a sufficient amount of time to determine upon a permanent appointment.

Mr. A. M. Elliott, a graduate of Harvard College, and a philological student for many years in Munich, has been since 1876 an associate in Romance philology, and has given lectures and conducted seminary exercises in Provençal, Old French, and the related languages and dialects of southern Europe. He was unfortunately prevented by a serious illness from resuming his duties at

the beginning of this term, but his early recovery and return are confidently anticipated. M. Rabillon, well known in Baltimore for his literary acquisitions and culture, has lectured annually in French upon classical authors and upon interesting periods in the literary history of France. The minor courses in French have been given during the past two years by Mr. P. B. Marcou, a graduate of Harvard, to whom both French and English have been from his earliest life familiar tongues. He still continues to be in charge of the introductory classes in French.

The authorities of the university have been desirous of giving special prominence to the study of the English language and literature, and three distinguished scholars of wide reputation have successively been invited to come here as professors. Two of them were Englishmen, who would not consent to cross the ocean, and the third was so strongly attached to his home in Cambridge that he could not be drawn away from it. The one last referred to, Professor Child, consented to lecture here in two successive winters. The impulse which he gave to the study of Early English by his courses on Chaucer and on ballads, and the pleasure derived from his interpretation of Shakespeare, are still gratefully remembered. The chief instruction in English philology has been given by younger men—first by Mr. A. S. Cook, Ph. D., now professor

of English in the University of California, and then by Mr. Henry Wood, Ph. D., still associate in English. Both these gentlemen have prosecuted their studies under able German teachers in Teutonic, and especially in English philology, the last named proceeding to a degree in Leipsic, the other in Jena. In connection with this branch of study, some attention has been given by other teachers to practical exercises in writing English, and to vocal culture by Mr. C. L. Woodworth.

During two years, lectures were given on English literature by Mr. Sidney Lanier, and we were anticipating continued co-operation from him; but the career of this gifted man was closed by death in the summer of 1881. A few of his friends in Baltimore, Boston, Atlanta, and other places, united in presenting to his widow a substantial testimonial of their appreciation of his character and works.

HISTORY AND POLITICAL SCIENCE.

Systematic instruction in history, (especially American,) has been given since 1876 by Mr. Austin Scott, Ph. D., of Washington; but his engagements with Mr. Bancroft, the historian, prevented him from giving his full time to our students, and the duties of an associate in history have devolved upon Mr. Herbert B. Adams, Ph. D., an Amherst graduate, who prosecuted his higher studies under

Bluntschli, at Heidelberg. A pleasing and substantial recognition of his relation to this distinguished jurist, who with Laboulaye and Lieber, have been called an international trifolium, has been made by the German citizens of Baltimore, who are about to present to the Johns Hopkins University the library of Bluntschli. It will be placed, with other works in historical and political science, in a convenient room which has been opened for the use of the seminary students in this department.

Political economy was taught during the years 1879–81 by Mr. H. C. Adams, Ph. D., now professor in the University of Michigan and lecturer in Cornell University, and during the year 1881–2 by Mr. Richard T. Ely, who now holds the position of an associate. Dr. Ely, after graduating in Columbia College, was a student in Heidelberg, where he was advanced to the degree of Ph. D.

In addition to the regular class instructions in history and political science from the persons already named, special courses have been given from time to time by non-resident lecturers. Our students have had the opportunity to hear Dr. H. von Holst, of the University of Freiburg, author of a constitutional history of the United States; Mr. E. A. Freeman, D. C. L., the historian of the Norman conquest; Mr. James Bryce, D. C. L.,

a regius professor in the University of Oxford, author of a work on the Holy Roman Empire; the greatly to be lamented Professor Diman, of Providence; Chief Justice Cooley, of Michigan; Gen. F. A. Walker, superintendent of the U. S. census; Professor Venable, of the law department of the University of Maryland; Prof. W. F. Allen, of the University of Wisconsin; Hon. J. J. Knox, comptroller of the currency; and Dr. H. C. Adams, now of the University of Michigan. It is not surprising to find that the young men among us have been greatly stimulated by these courses of lectures, and are themselves disposed to take up careful and prolonged inquiries upon important subjects suggested by their studies. Dr. H. B. Adams has led them to a series of interesting investigations upon the origin of American institutions. Aided by the various historical societies of this country, (especially our own, the Maryland Historical Society,) and availing himself of the local interests of a company of students drawn from widely separated parts of this country, he has secured from these pupils a valuable series of historical monographs which are about to be published under his editorial supervision. Mr. Freeman has written an introduction to this series. Four papers by Dr. Adams will first be printed, and then will come a series of essays, by the members of the seminary, on local government in the older States.

LOGIC, ETHICS, AND HISTORY OF PHILOSOPHY.

It has been from no want of interest in philosophical studies, that we have been delayed in making permanent arrangements in regard to them; but the scheme of lectures as now arranged offers some noteworthy opportunities.

Professor George S. Morris, Ph. D., who has spent a portion of every year among us since 1878, continues to lecture on the history of philosophy and on ethics. The fruit of his call to a congenial work may be seen not only in his own published volumes, but also in the series of philosophical studies which he is editing, beginning with his own study of Kant's Kritik, which was given to his students in this university in the course of last winter.

Mr. Charles S. Peirce, who has been for a long period a close student of the processes employed in various branches of physical investigation, and who is a proficient in more than one department of science, now offers to our students instruction in logic, or the method of methods, particularly for the benefit of those who are expecting to be engaged in investigation and who need fundamental guidance in the principles which underlie the discovery of scientific truth.

Several papers written by his followers in preceding years, with one of his own numerous

memoirs, hitherto unprinted, have been sent to the press and will soon be published. His rare collection of works upon logic, particularly rich in scholastic philosophy, has been acquired partly by purchase and partly by Mr. Peirce's generous gift.

Professor G. Stanley Hall, Ph. D., will hereafter direct our students in psychology, a service for which he has become fitted by his historical studies, by prolonged work in the laboratories of Leipsic and Berlin, and by varied experience as a lecturer in Harvard, Williams, and other colleges. Dr. Hall is desirous of awakening the attention of our students, particularly of those who expect to become teachers, to the importance of scientific pedagogics, and will doubtless offer some definite instruction in this subject.

EXAMINATIONS AND DEGREES.

Our staff of instructors is desirous of maintaining the best possible system of examinations, so that the degrees we confer and the certificates we give may be everywhere recognised as meaning what they say. There is danger on the one hand, where it is assumed that the instructor will be strict, that a knowledge on the part of his pupils of his ways and favourite points may lead to "cramming" to meet these points, and so the examination may appear to be of a rigid and

minute character, and yet may tell very little about the real acquisitions of the class; and on the other, where the instructor is known to be good natured, that the examination will be so slight that slipping through will be easy. But more than this, there is the natural infirmity of all persons, even the most conscientious, to be guarded against—that, namely, of a disinclination to see short-comings in the work of their own hands. When an instructor has had students under his charge for a year, he will be naturally reluctant, except in cases of exceptional or total failure, to certify that they have, after all, but a slender acquaintance with the subject they have been learning. It may very well be the case that this supposed failure on the part of the students examined may be entirely due to their own incompetence or carelessness; but the instructor can hardly help feeling that it may be otherwise interpreted, and accordingly his natural and probably unconscious leaning must be rather to pass as large a number of his class as possible, than to maintain the ideal standard of excellence which he probably had in his mind when he began to read the papers.

The only sure way of guarding against all these tendencies to bring down the character of examinations from the ideal standard is, as it seems to most of us, the employment of paid experts to act as coadjutors with the regular teachers in the work of examination. Each instructor in our under-

graduate classes is now encouraged to test, in his own way, the proficiency of his students, at frequent intervals during the session; and the result of this examination is recorded at the registrar's office at least twice in every academic year. The university, as a body, will hold one examination, instead of two as heretofore, of all candidates for the bachelor's degree, and will enlist, as far as practicable, for this service those who have not been teachers of the students to be examined. This plan has already been the regular usage in respect to the classes in Greek, Latin, German, and French—and is believed to be applicable elsewhere. We have received valued co-operation from Professors Maupin and Raddatz, of the city college, and from other non-resident professors.

In like manner, candidates for the second degree, (doctor of philosophy,) have in all cases been examined by the entire staff of professors, and often by some of the associates, and quite frequently by scholars of distinction holding chairs in other colleges and universities.

The effect of these regulations is to hold before the younger and the older candidates perpetually the notion that their attainments are to be judged by those who are strangers to them, and that their standing depends on the knowledge they show of a subject, rather than on their familiarity with a text book. As a means of intellectual discipline,

testing at intervals all the faculties of a student, his accuracy, his discrimination, his judgment, his memory, and his range, nothing better has been devised.

Each candidate for the bachelor's degree has been required to pursue during his undergraduate career, at least five courses of study, two of them, called major courses, implying that, by a two years' course, he has become proficient in each subject, and three other, minor courses, each of which he has studied for at least a year. An additional course, known as the composite minor, consisting of lectures and exercises in ethics, history, and English, and equivalent, as a whole, to one of the other minor courses, has been recently arranged. This will hereafter be required, in addition to the three other minor courses, from all candidates for the bachelor's degree.

The preference of courses shown by the forty-six persons who have taken the bachelor's degree, during the last four years, is exhibited by the following table:

	Major Courses.	Minor Courses.		Major Courses.	Minor Courses.
Latin,	21	9	Biology,	6	1
German,	17	27	French,	2	27
Greek,	12	5	Philosophy,	1	3
Chemistry,	11	10	English,		5
History,	10	12	Logic,		1
Mathematics,	7	3	Mineralogy,		1
Physics,	6	30			

The number of undergraduates who have come forward to the baccalaureate degree, during the

year, is fifteen, making the whole number of bachelors of arts, here created in four years, forty-six. The names of those graduating in 1881–82, are as follows:

William H. Adkins, Easton.
T. Alexis Berry, Baltimore.
Gustav Bissing, Baltimore.
Walter B. Clarkson, Baltimore.
Hermann L. Ebeling, Catonsville.
Louis Garthe, Baltimore.
Edward Ingle, Baltimore.
Richard F. Kimball, Baltimore.
Gustav A. Liebig, Jr., Baltimore.
C. W. Emil Miller, Baltimore.
James Page, Baltimore.
Albert G. Palmer, Baltimore.
Robert M. Reese, Baltimore.
Lewis T. Stevens, Baltimore.
Herbert T. Tiffany, Baltimore

Nine candidates who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy. The whole number of persons admitted among us to this second degree is thirty-three. Nearly all of these are looking forward to the profession of teaching as a career in life; twenty-nine of them have already received appointments in colleges and other educational establishments.

The names of the doctors of philosophy (1881–82) and the titles of their theses are as follows:

James W. Bright, of Lock Haven, Pa., A. B., Lafayette College, 1877, and A. M., 1880. His principal study was the Teutonic languages, the subordinate, Sanskrit. He submitted a thesis entitled "A Discussion of the Verbal forms in King Alfred's West-Saxon Version of Gregory's *Cura Pastoralis.*"

J. Franklin Jameson, of Amherst, Mass., A. B., Amherst College, 1879. His principal study was history, the subordinate, political economy. His thesis on "The Origin and Development of the Municipal Government of New York City," is in course of publication in the *Magazine of American History.*

Mitsuru Kuhara, Tsuyama, Japan, S. B., University of Tokio, 1877. His principal study was chemistry, the subordinate, mineralogy. His thesis on the "Oxidation of Nitrometaxylene," has been published, in modified form, in the *American Chemical Journal.*

Robert W. Mahon, of Baltimore, C.E., Lehigh University, 1876. His principal subject was chemistry, his subordinate, physics. His thesis on "Some Investigations on the Benzyl-derivatives of the Sulphamides of Metaxylene," has been published in modified form, in the *American Chemical Journal.*

Oscar H. Mitchell, of Marietta, Ohio, A. B., Marietta College, 1875, and A. M., 1878. His principal subject was mathematics, the subordinate, logic. His thesis, entitled "Some Theorems in Numbers, with a Generalization of Fermat's and Wilson's Theorems," has been published in the *American Journal of Mathematics.*

George F. Nicolassen, of Baltimore, A. B., University of Virginia, 1879, and A. M., 1880. His principal subject was Greek, the subordinate, Latin. His thesis on "The Articular Infinitive in Xenophon," will be prepared for publication.

William A. Noyes, of Grinnell, Iowa, A. B., Iowa College, 1879. His principal subject was chemistry, the subordinate, physics. His thesis "On the Protection from Oxidation of a Group containing two Carbon-Atoms," has been published, in modified form, in the *American Chemical Journal.*

Chase Palmer, of Baltimore, A. B., Johns Hopkins University, 1879. His principal subject was chemistry, the subordinate, mineralogy. His thesis "On the Sulphocinnamic Acids," has appeared, in modified form, in the *American Chemical Journal.*

Edward H. Spieker, of Baltimore, A. B., Johns Hopkins University, 1879. His principal subject was Greek, the subordinate subjects, Latin, Sanskrit, and Hebrew. His thesis "On the so-called Genitive Absolute and its use, especially in the Attic Orators," will be prepared for publication.

Fellowships and Scholarships.

The system of fellowships which has been adopted here, has been most fruitful in good results, as may readily be discovered from a scrutiny of the roll of fellows, and by reference to the bibliography which is printed in the appendix. If any proof of the value of the system is needed beyond our own experience, it may be found in the fact that its essential features have been followed in two foreign universities, and are now reported

to be under consideration in a third. A statement of the scheme of fellowships and of the rules under which they are awarded is made in the appendix.

The founder of the university provided for the establishment of certain scholarships. His language upon this subject is as follows:

"And I further request the trustees of the said university to establish from time to time, such number of free scholarships in the said university as may be judicious, and to distribute the said scholarships amongst such candidates from the States of Maryland, Virginia, and North Carolina, as may be most deserving of choice, because of their character and intellectual promise; and to educate the young men, so chosen, free of charge."

Twenty such scholarships, known as Hopkins Scholarships, freeing the holders from charges for tuition, were offered at the commencement of the university to young men who needed this assistance, and more have been since annually awarded. No publicity has been given to the names of those appointed. During the past six years, seventy young men from the States designated have received the benefit of this provision.

By a contribution from the president and professors, two graduate scholarships, of two hundred and fifty dollars each, were bestowed during the year 1879-80; and during each of the two following years, ten graduate scholarships of the same value have been bestowed from the university income upon students who gave special evidence to the faculty of exceptional merit in the prosecution of their studies.

A scholarship, yielding three hundred and fifty dollars, contributed by two friends of the university, was also awarded in 1880 for the encouragement of special study in philosophical subjects. Of the sum above named, $250 were given by Mr. Allan Marquand, and $100 were added by one of the trustees, for the further encouragement of the chosen recipient.

To show his interest in the Baltimore City College, an officer of the university has given, for three years, a premium of one hundred dollars to that graduate of the city college who passed the best matriculation examination on his admission to the university. Although the persons who have received this prize are in all respects excellent and promising students, its general influence has not been sufficiently marked to encourage a renewal of the offer.

University Societies, etc.

Several associations, composed of members of the faculty and advanced students, meet regularly for the presentation and discussion of original papers. The circulars contain abstracts of the more important communications. There are also reading clubs for the regular examination of the scientific periodicals which are received in such abundance.

These societies are:

1. The Scientific Association, meeting under the presidency of Professor Sylvester.
2. The Philological Association, meeting under the presidency of Professor Gildersleeve.
3. The Mathematical Society, meeting under the presidency of Professor Sylvester.
4. The Historical Association, of which Dr. H. B. Adams is the secretary.
5. The Metaphysical Club, of which Professor C. S. Peirce is the head.
6. A Naturalists' Field Club, organized under the leadership of Professor Martin.

Reading clubs are organized in:

Chemistry, under Professor Remsen and Dr. Morse.
Biology, under Professor Martin and Dr. Brooks.
Physics, under Professor Rowland and Dr. Hastings.

THE LIBRARY.

It has been found of so great advantage that those members of the university who are engaged in original research or other advanced work, shall have at hand those books which are needed in their studies or investigations, that there is at present a growing tendency in the library department to develop in the direction of special libraries auxiliary to the leading branches of study, and placed in the rooms where those studies are carried on. The nuclei of such special libraries have already been formed in the departments of Greek, chemistry, history, political economy, and education; and it seems probable that other departments will, in the course of time, adopt this plan, leaving the main collection to assume more and more the character of a library of general reference.

The close association of those following similar researches, and animated by the same zeal, is an active stimulus and a great help to work; and this is still further assisted by placing those books which are most likely to be needed, or which specially bear upon the work, within easy reach of the worker's hand.

The library now includes 13,200 bound volumes, purchased at a cost of $38,000. It is open daily for thirteen hours, and comprises:

A collection of books for general reference, including not only cyclopædias and dictionaries, but copies of the works of great authors, ancient and modern, in different branches of literature and science;

Special collections of books which have been bought as the working apparatus of the chief departments of study, from lists which have been furnished by the several instructors, and which are placed either in the main library, or in the special libraries above referred to;

A transient collection of new books, English, French, and German, brought here for examination as soon as published, sometimes by purchase, and sometimes by the courtesy of dealers;

A collection of scientific and literary periodicals, now numbering three hundred and thirty-eight. This list is supplemented by those of the Peabody Institute and other institutions of the city, so that

the whole number of journals accessible to students (exclusive of ephemeral publications) exceeds seven hundred. They pertain to all departments of knowledge and come from all parts of the globe.

I would here call attention to the very useful as well as beautiful system on which the libraries of Baltimore have been planted and are growing.

In the first place, there is the Peabody Library, a great storehouse of reference works, well arranged in a noble building, thoroughly catalogued and indexed, accessible to all students from 9 a. m. to 9 p. m., without charge.

Next, there are the collections of the Johns Hopkins University. These are the books of the laboratory and the seminary, that is to say, special libraries formed by specialists for special purposes, and distributed accordingly in many different apartments where they may be most readily reached by those who wish to work with them.

These collections are soon to be supplemented by the Enoch Pratt Free Library. This is a library for circulation, where books may not only be read, but where they may be also borrowed for home reading. Its use will be open to all, without charge.

Near by is a social library, the Mercantile, which has recently been provided with excellent quarters, by the enlightened policy of its president; a place where the current magazines and journals as well as popular books may readily be seen.

There is also the remarkable collection of the Maryland Historical Society, rich in Americana, and especially in manuscripts, pamphlets, and books pertaining to Maryland and the adjacent region.

There are also three professional libraries, that of the Baltimore Bar, and of the Medical and Chirurgical Faculty, maintained by the legal and medical men of the city, and the Stinnecke collection in ecclesiastical history and theology, founded by Bishop Whittingham.

The city has also its important collections of municipal documents in the city hall.

It thus appears that according to his needs the student may have access to a storehouse of books, a literary laboratory, a circulating library, and to the special apparatus of the historian, the civic officer, the physician, the jurist, and the theologian. All these collections are included within a circle of a half-mile radius, in the centre of which stands the Enoch Pratt Free Library, like a central fountain for popular resort. Is not Baltimore in its library policy an example to other cities?

The number of bound volumes in the principal libraries of the city is:

Peabody Library,	77,000
Mercantile Library,	37,700
Maryland Historical Society,	22,000
Johns Hopkins University,	13,200
Bar Library,	8,800
Medical and Chirurgical Library,	3,300
Whittingham Library,	17,000
	179,000

The principal libraries of Washington, which are readily accessible to our students, include the Library of Congress, with 650,000 books and pamphlets; that of the Surgeon General's Office, with 120,000; that of the Bureau of Education, with 50,000; as well as those of the various administrative bureaus and scientific departments of the government.

PUBLIC LECTURES.

Our system of public lectures is now, I think, generally understood, but it may interest even those who are most familiar with them, to look back and see how many courses have been given within the last six years, and how many eminent men from a distance have been among us. These lectures are chiefly designed to be supplementary to our regular classes. Attendance upon them is voluntary, and no credit is given on our books for being present, but the brighter young men are quick enough to discover what excellent opportunities are afforded in these courses for the acquisition of knowledge, and they need no other encouragement to attend. Incidentally the university receives much benefit from the frequent presence of strangers among us, and more than one of our advanced scholars attributes his subsequent career to the acquaintance formed in our hall with professors from other institutions.

The public have been admitted to these lectures as freely as was possible in the very limited space at command. When there has been a demand for more cards of admission than there were sittings, invitations have been given first to those who were known to us as special students of the subject of the lecture, and next to those who were engaged in teaching. The audiences have thus been made up almost wholly of those who could enjoy and profit by academic instruction.

The following table shows the names of the lecturers, their subjects, the number of lectures given, and the average attendance for each course, according to the door-keeper's count. Some lectures, as those by Professor Cayley on mathematical subjects, and those by Mr. C. S. Peirce on mathematical logic, are not included in the statement, because they were not intended for any but special scholars.

Subject.	Lecturer.	Average Attendance.
National Debts, (9),	H. C. Adams,	41
Religion and Government in the Ancient World, (2),	H. B. Adams,	19
Beginnings of Church and State, (10),	H. B. Adams,	83
Italian Renaissance, (10),	H. B. Adams,	212
Teutons in Church and State, (5),	H. B. Adams,	212
Internationalism, (5),	H. B. Adams,	193
History of the Fourteenth Century, (20),	W. F. Allen,	96
Photophone and Spectrophone, (1),	A. Graham Bell,	235
History of Medicine, etc., (20),	J. S. Billings,	49
German Literature prior to the Classical Period, (9),	H. C. G. Brandt,	42
Theories of Biology, (16),	W. K. Brooks,	30
Recent Studies of the Crab and the Oyster, (3),	W. K. Brooks,	73

Subject.	Lecturer.	Average Attendance.
Recent Political Discussions in England, (6),	J. Bryce,	169
Chaucer, (20),	F. J. Child,	191
Ballads of England and Scotland, (20),	F. J. Child,	137
Shakespeare's Plays: Hamlet, Macbeth, (10),	F. J. Child,	195
Early England, (6),	A. S. Cook,	196
Torts, (20),	T. M. Cooley,	87
Recent Amendments to the Constitution of the United States, (6),	T. M. Cooley,	103
Evils in Local Government, (6),	T. M. Cooley,	87
The New Testament, (10),	J. M. Cross,	12
Thirty Years' War, (20),	J. L. Diman,	192
Dante, (10),	A. M. Elliott,	152
The Civil Service, with special reference to that of Prussia, (4),	R. T. Ely,	63
Selected Botanical Subjects, (6),	W. G. Farlow,	89
Historical Geography of South-eastern Europe, etc., (6),	E. A. Freeman,	91
Greek Lyric Poetry, (20),	B. L. Gildersleeve,	42
Homer's Odyssey, (20),	B. L. Gildersleeve,	153
Introductory to Greek Prose Literature, (12),	B. L. Gildersleeve,	80
Greek Tragic Poets, (9),	B. L. Gildersleeve,	114
Republic of Plato, (8),	W. W. Goodwin,	152
Psychology, (10),	G. S. Hall,	190
Clear Thinking and its Best Modern Methods, (5),	G. B. Halsted,	61
Theory of Sound in its Relation to Music, (6),	C. S. Hastings,	162
Light, (4),	C. S. Hastings,	208
Territorial Surveys, (20),	J. E. Hilgard,	21
The Senses and the Brain and their Relation to Thought, (10),	W. James,	62
Banking Systems of the United States, (3),	J. J. Knox,	175
Sun and Radiant Energy, (6),	S. P. Langley,	207
English Verse, (16),	Sidney Lanier,	170
English Literature, (12),	Sidney Lanier,	195
The Vedas, (6),	C. R. Lanman,	151
Early French and Italian Literature, (20),	J. R. Lowell,	179
Waste Products of Chemical Manufacture, (20),	J. W. Mallet,	29
History of the Chief Branches of Chemical Industry, (20),	J. W. Mallet,	45
General Biology, (20),	H. N. Martin,	66

Subject.	Lecturer.	Average Attendance.
The Human Body, (4),	H. N. Martin,	249
The Political Situation in Eastern Europe, (4),	D. McG. Means,	70
Political Economy in the United States, (4),	D. McG. Means,	15
Theory of Development, (7),	J. McCrady,	197
General History of Philosophy, (20),	G. S. Morris,	124
Topics in Ethics, (14),	G. S. Morris,	123
British Thought and Thinkers, (12),	G. S. Morris,	123
History of German Philosophy, (6),	G. S. Morris,	148
The Hebrew Scriptures, (9),	T. C. Murray,	41
History of Astronomy, (20),	S. Newcomb,	50
History of the Formation of the French Language (*in French*), (19),	L. Rabillon,	20
History and Evolution of the French Language (*in French*), (20),	L. Rabillon,	48
French Romantic Literature (*in French*), (11),	L. Rabillon,	35
French Epic Poetry (*in French*), (12),	L. Rabillon,	57
Readings in Corneille, Molière, etc. (*in French*), (12),	L. Rabillon,	47
Satirists of France (*in French*), (12),	L. Rabillon,	58
French Poetry, etc. (*in French*), (10),	L. Rabillon,	56
French Literature (two courses) (*in French*), (24),	L. Rabillon,	48
History of Chemistry, (12),	I. Remsen,	111
Selected Topics in Chemistry, (4),	I. Remsen,	229
Conservation of Energy, (4),	H. A. Rowland,	183
Studies on the "Return to Kant," (5),	J. Royce,	18
Poetry of the German Romantic School, (8),	J. Royce,	33
Cyprus and Mycenae, (8),	A. D. Savage,	81
English History, (12),	A. Scott,	37
Development of the U. S. Constitution, (10),	A. Scott,	99
Greece in the Fifth Century, B. C., (10),	E. G. Sihler,	39
Attic Life and Society, (3),	E. G. Sihler,	30
Laws of Verse, (1),	J. J. Sylvester,	235
Philosophy of Physics, (12),	J. Trowbridge,	142
Constitutional Law, (12),	R. M. Venable,	103
The German Empire, (10),	H. von Holst,	258
Money, (20),	F. A. Walker,	49
Finance, (21),	F. A. Walker,	44
Historical Development of the Inflective Structure of the Indo-European Languages, (18),	W. D. Whitney,	84

Special courses of lectures and demonstrations in respect to the recent progress of physiology, have been given to medical men by Professor Martin, Dr. Sewall, etc.

An effort has also been made to be of service to the teachers of Baltimore, not only by admitting them to public lectures, but also by establishing special Saturday classes for their benefit. The following courses, to which teachers only were admitted, have been given:

1. On Physiology, by Professor Martin, twenty lectures, accompanied by practical instruction in twenty weekly exercises, in the biological laboratory.
2. On Elementary Zoölogy, by Dr. Brooks, fifteen lectures and forty-five hours of connected work in the biological laboratory.
3. On the theory of Numbers, by Dr. W. E. Story, ten lectures.
4. On improved methods of beginning the study of Latin, twenty exercises by Professor C. D. Morris.
5. On Early English, by Mr. A. S. Cook, twelve lectures on the basis of a simple Anglo-Saxon text.

The attendance at all these lectures was as punctual and regular as if a degree depended on it, and at the close of each course there was a grateful recognition on the part of the class, of the benefits they had received.

Many of the instructors have also lectured by invitation before associations in different parts of the city and in its neighborhood. This is no part of the official work of our staff and no report is made of it, but it has pleased me, and I am sure it will please others, to notice in how many local

institutions the officers of the university have, by invitation, delivered lectures or addresses.

University of Maryland (Medical Faculty.)
Medical and Chirurgical Faculty of Maryland.
Peabody Institute.
Maryland Institute.
McDonogh Institute.
Canton Institute.
Woodberry Institute.
Baltimore and Ohio employees.
St. Peter's Brotherhood.
St. Michael's Guild.
Maryland Historical Society.
Maryland Academy of Sciences.
Young Men's Christian Association.
State Normal School.
Baltimore County Teachers' Association.
Baltimore City Teachers' Association.
Educational Conference of Friends.
Various private schools.
Etc., etc.

It would be much more difficult for me to give an idea of the charitable and benevolent services in which the members of the university take part, but I may mention as particularly good the instructions of some of our young men on Sundays among the inmates of the penitentiary and in various mission schools.

Publications.

As soon as the academic staff of the university came together, it was obvious that means should be provided for the publication of their scientific and literary papers. The want was first felt in the department of mathematics. It was suggested to Professor Sylvester that he should ask his colleagues in the London Journal of Mathematics to transfer its publication to Baltimore, but on further consideration it appeared that the mathematicians

of this country were agreed in desiring to see an American periodical devoted to the most advanced investigations in this science. A large number of letters were received from college professors and from the mathematicians in the government service commending a plan submitted to them for the publication of such a journal. The trustees having promised their pecuniary aid, the first number of the American Journal of Mathematics was published in quarto form in 1878. Four volumes have since been issued, and there appears to be no want of material for its continuance. Dr. Story, Dr. Franklin, and Dr. Craig have successively given their assistance to the editor, Professor Sylvester, in the conduct of the journal.

The work of the chemists next came under consideration. Such papers as they had to offer were too extended to be printed in the American Journal of Science, and it was inconvenient to continue sending them to Germany; and so, after various propositions had been duly weighed, the determination was reached to publish in Baltimore the American Chemical Journal, to be edited by Professor Remsen. The trustees promised their assistance, and three annual volumes have now appeared, containing contributions from the principal chemical laboratories of this country. The issue began in April, 1879.

To promote the study of language, Professor Gildersleeve was led to begin the American

Journal of Philology, encouraged partly by the numerous promises of co-operation received from widely separated philological students, and partly by the assurance that his effort would be sustained to a certain extent by the university. The first number appeared in February, 1880, and the third volume is now in progress.

The biological papers have been printed in various forms. Some were contributed to the Journal of Physiology; some were printed at the expense of a few generous friends of the university; and others at the cost of the Johns Hopkins fund. They have been collected under the editorial supervision of Professor Martin and Dr. Brooks, with the title of Studies from the Biological Laboratory. Unlike the publications already referred to, these papers are only by members of our own staff, the teachers and students of biology.

The volume of Contributions to Logic now in press, under the editorial care of Mr. C. S. Peirce, will contain papers with the following titles:

The logic of the Epicureans, by Allan Marquand.
On the algebra of logic, by Miss Ladd.
On the algebra of logic, by O. H. Mitchell.
On relative numbers, by B. I. Gilman.
On probable inference, by C. S. Peirce.

The early numbers of the Studies in Historical and Political Science, edited by Dr. H. B. Adams, will include the following papers:

Introduction to American institutional history, by E. A. Freeman.
The Germanic origin of New England towns, by H. B. Adams.

Saxon tithingmen in America, by H. B. Adams.
Norman constables in America, by H. B. Adams.
Village communities in America,—Cape Ann and Salem plantations, by H. B. Adams.
Local government in Illinois, by Albert Shaw.
Local government in Pennsylvania, by E. R. L. Gould.
Origin and development of the municipal government of New York City, by J. F. Jameson.
Administration of Berlin compared with that of New York, by R. T. Ely.
Local self-government in South Carolina, etc., by B. J. Ramage.
Local institutions of Ohio—Indian, French, and English, by John T. Short and S. C. Derby.
Local government of Michigan and the North-west, by E. W. Bemis.
French and English institutions of Wisconsin, by W. F. Allen.
Civil government in Iowa, by Jesse Macy.
Old town institutions of Maryland, by L. W. Wilhelm.
Old Maryland manors, by John Johnson.
Parish institutions of Maryland, by E. Ingle.
Free schools in Maryland, by Basil Sollers and L. W. Wilhelm.
The institutions of North Carolina, by Henry E. Shepherd.
Montauk and the common lands of Easthampton, Long Island, by J. F. Jameson.

Since the opening in 1876, it has been found convenient to issue frequent statements in respect to the development of our plans. The earliest of these official circulars were printed in octavo. Nearly three years ago the form was changed to a quarto, and some of the features of the University Reporter of Cambridge, England, were introduced, particularly current announcements of lectures and courses of instruction. These bulletins were originally designed for the information of those who were connected with this university, or who wished to enter it; but they soon proved to be a convenient channel for acquainting the public at large with the condition of the foundation, and for spread-

ing information in respect to scientific and literary investigations which were here in progress. Gradually the reports of society meetings, and the synopses of scientific papers claimed more and more space, and a demand for the successive circulars was indicated far beyond the company for which the original publication had been designed; and even to a limited extent in foreign countries.

It is now thought best to modify in some particulars the plan of the circulars, so as to give still more space to the original work of the professors in the university and their more advanced students, without omitting the current information in respect to the plans of instruction, the rolls of attendance, and other purely local matters.

Our publications are offered to subscribers, and are also the basis of important exchanges with foreign institutions and journals, as well as with many in this country.

Conclusion.

Such is the report which may be made to the trustees, and through them to the public, of the beginnings of the Johns Hopkins University. No one knows better than those who are engaged in its service, how many circumstances have favored this institution. Large funds bestowed by a large-minded benefactor; carefully drawn and wisely

considered instruments by which the corporation was organized; trustees who had no personal ends to promote, but were eager to secure the best possible results and were liberal and co-operative in all their official actions; able teachers thoroughly interested in their work; citizens watching with the closest scrutiny and with encouraging words all our announcements; neighboring foundations, (in several of which the Hopkins trustees were enlisted), ready to lend a helping hand; newspapers whose columns have been open to the record of every progressive step; and moreover, students of talent and industry eager to avail themselves of the opportunities here afforded; these have been the factors of our brief history.

There is still much to be done. Near at hand must be the initiation of a department of medicine. Other important subjects, hitherto passed by, must soon receive attention. I will not now dwell upon these points. I will only add my personal acknowledgments to the governing bodies, the trustees and teachers, for their considerate counsel and generous co-operation during the past six years, and especially for their kindness and helpfulness during the last year when, by reason of ill-health, I was so long prevented from discharging my usual duties. I am reminded that four of the twelve trustees who organized this university, are no longer members of the board. Let me renew an expres-

sion of my obligations to one who is deceased, to Galloway Cheston, a friend of the founder, and first president of the trustees, whose wisdom, moderation, and farsightedness have helped to lay firmly the foundations on which we are building.

DANIEL C. GILMAN,
President of the Johns Hopkins University.

BALTIMORE, *October* 2, 1882.

APPENDIX.

A.

Academic Staff, 1876-82.*

PRESIDENT.

		Appointed.
DANIEL C. GILMAN,		*December* 30, 1874.

PROFESSORS.

		Appointed.
BASIL L. GILDERSLEEVE,	*Greek*,	1876.
J. J. SYLVESTER,	*Mathematics*,	1876.
IRA REMSEN,	*Chemistry*,	1876.
HENRY A. ROWLAND,	*Physics*,	1876.
H. NEWELL MARTIN,	*Biology*,	1876.
CHARLES D. MORRIS,	*Classics*,	1876.

ASSOCIATES.

		Years of Service.
JOHN M. CROSS,	*Greek*,	1876–1881.
PHILIP R. UHLER,	*Natural History*,	1876–
AUSTIN SCOTT,	*History*,	1876–1882.
A. MARSHALL ELLIOTT,	*Romance Philology*,	1876–
THOMAS C. MURRAY,	*Shemitic*,	1876–1879.
HERMAN C. G. BRANDT,	*German*,	1876–1882.
WILLIAM K. BROOKS,	*Biology*,	1876–
HARMON N. MORSE,	*Chemistry*,	1876–
ROBERT RIDGWAY,	*Natural History*,	1876–1877.
WILLIAM E. STORY,	*Mathematics*,	1876–
ARTHUR W. TYLER,	*Librarian*,	1876–1878.
CHARLES S. HASTINGS,	*Physics*,	1876–
CHARLES R. LANMAN,	*Sanskrit*,	1877–1880.
HERBERT B. ADAMS,	*History*,	1878–
ALBERT S. COOK,	*English*,	1879–1881.
MINTON WARREN,	*Latin*,	1879–
WILLIAM HAND BROWNE,	*Librarian*,	1879–

*The names in each group are arranged in the order of appointment.

		Years of Service.
HENRY SEWALL,	*Biology*,	1880–1882.
THOMAS CRAIG,	*Mathematics*,	1880–
MAURICE BLOOMFIELD,	*Sanskrit*,	1881–
WILLIAM T. SEDGWICK,	*Biology*,	1881–
HENRY WOOD,	*English*,	1881–
FABIAN FRANKLIN,	*Mathematics*,	1882–
RICHARD T. ELY,	*Political Economy*,	1882–

LECTURERS.

SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*,	1877.
FRANCIS J. CHILD,	*Early English, etc.*,	1877–1878.
THOMAS M. COOLEY,	*Law*,	1877–1879.
JULIUS E. HILGARD,	*Geodetic Surveys*,	1877.
JAMES RUSSELL LOWELL,	*Romance Literature*,	1877.
JOHN W. MALLET,	*Technological Chemistry*,	1877–1878.
FRANCIS A. WALKER,	*Political Economy*,	1877–1878.
WILLIAM D. WHITNEY,	*Comparative Philology*,	1877.
WILLIAM F. ALLEN,	*History*,	1878.
WILLIAM JAMES,	*Psychology*,	1878.
GEORGE S. MORRIS,	*Philosophy*,	1878–
J. LEWIS DIMAN,	*History*,	1879.
H. VON HOLST,	*History*,	1879.
WILLIAM G. FARLOW,	*Botany*,	1879.
J. WILLARD GIBBS,	*Theoretical Mechanics*,	1879.
SIDNEY LANIER,	*English Literature*,	1879–1881.
CHARLES S. PEIRCE,	*Logic*,	1879–
JOHN TROWBRIDGE,	*Physics*,	1880.
A. GRAHAM BELL,	*Phonology*,	1881.
S. P. LANGLEY,	*Physics*,	1881.
JOHN MCCRADY,	*Biology*,	1881.
JAMES BRYCE,	*Political Science*,	1881
EDWARD A. FREEMAN,	*History*,	1881.
JOHN J. KNOX,	*Banking*,	1881.
ARTHUR CAYLEY,	*Mathematics*,	1882.
WILLIAM W. GOODWIN,	*Plato*,	1882.

		Years of Service.
G. Stanley Hall,	*Psychology,*	1882–
Richard M. Venable,	*Constitutional Law,*	1882.
James A. Harrison,	*Anglo-Saxon,*	1882–
J. Rendel Harris,	*New Testament Greek,*	1882–

INSTRUCTORS AND ASSISTANTS.

Henry Sewall,	*Biology,*	1876–1878.
Samuel F. Clarke,	*Biology,*	1879–1881.
Fabian Franklin,	*Mathematics,*	1879–1882.
Lyman B. Hall,	*Chemistry,*	1879–1880.
Christian Sihler,	*Biology,*	1879–1880.
Henry C. Adams,	*Political Economy,*	1879–1881.
Thomas Craig,	*Mathematics,*	1879–1880.
Chas. L. Woodworth,	*Elocution,*	1879–
William T. Sedgwick,	*Biology,*	1880–1881.
Edwin H. Hall,	*Physics,*	1880–1881.
George H. Stockbridge,	*Latin and German,*	1880–1881.
Philippe B. Marcou,	*French,*	1880–
Hugh Newell,	*Drawing,*	1880–
R. Dorsey Coale,	*Chemistry,*	1881–
Richard T. Ely,	*Political Economy,*	1881–1882.
Lawrence B. Fletcher,	*Physics,*	1881.
George F. Nicolassen,	*Greek and Latin,*	1881–1882.
Benjamin E. Smith,	*Philosophy,*	1881–1882.
Edmund B. Wilson,	*Biology,*	1881–1882.
James W. Bright,	*German,*	1882–
J. Franklin Jameson,	*History,*	1882–
Edward H. Spieker,	*Greek and Latin,*	1882–
Harry F. Reid,	*Physics,*	1882–

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

		Years of Service.
HENRY C. ADAMS, PH. D.,	*Political Science*,	1876–1879.
Lecturer on Political Economy, University of Michigan.		
HERBERT B. ADAMS, PH. D.,	*History*,	1876–1878.
Associate in History, Johns Hopkins University.		
WILLIAM K. BROOKS, PH. D.,	*Biology*,	
Associate in Biology, and Director of Chesapeake Zoölogical Laboratory, Johns Hopkins University. (*Appointed Associate*, 1876, *before entering on the Fellowship*).		
THOMAS CRAIG, PH. D.,	*Mathematics*,	1876–1879.
Associate in Mathematics, Johns Hopkins University.		
JOSHUA W. GORE, C. E.,	*Mathematics*,	1876–1878.
Professor of Natural Science, University of North Carolina.		
GEORGE B. HALSTED, PH. D.,	*Mathematics*,	1876–1878.
Instructor in Post-Graduate Mathematics, Princeton College.		
EDWARD HART, PH. D.,	*Chemistry*,	1876–1878.
Assistant Professor of Chemistry, Lafayette College.		
DANIEL W. HERING, C. E.,	*Engineering*,	1876–1878.
Professor of Mathematics, Western Maryland College.		
MALVERN W. ILES, PH. D.,	*Chemistry*,	1876–1878.
Chemist, Leadville, Colorado.		
WILLIAM W. JACQUES, PH. D.,	*Physics*,	1876–1879.
Electrician of the American Bell Telephone Co., Boston, Mass.		
CHARLES R. LANMAN, PH. D.,	*Sanskrit*,	1876–1877.
Professor of Sanskrit, Harvard University.		
D. MCGREGOR MEANS, A. B.,	*Political Science*,	1876–1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.		
HARMON N. MORSE, PH. D.,	*Chemistry*,	
Associate in Chemistry, Johns Hopkins University. (*Appointed Associate*, 1876, *before entering upon the Fellowship*).		
WALTER H. PAGE,	*Greek*,	1876–1878.
Late Professor in the Louisville (Ky.) High School.		
P. PORTER POINIER, M. E.,	*Physics*,	
(*Died without entering upon the Fellowship, June*, 1876, *aged* 23 *years*).		
E. DARWIN PRESTON, C. E.,	*Engineering*,	1876–1878.
U. S. Coast and Geodetic Survey, Washington, D. C.		
HENRY J. RICE, SC. D.,	*Biology*,	1876–1878.
Professor of Natural Sciences, Michigan Military Academy, Orchard Lake, Mich.		
JOSIAH ROYCE, PH. D.,	*Philosophy*,	1876–1878.
Instructor in Philosophy, Harvard University.		

ERNEST G. SIHLER, PH. D., . . *Greek*, . . . 1876–1879.
Classical Instructor, New York City.

FREDERICK B. VAN VORST, A. B., . *Ethics & Metaphysics*, 1876–1877.
Attorney at Law, New York City.

JOHN H. WHEELER, PH. D., . . *Philology*, . . 1876–1877.
Professor of Greek, University of Virginia.

SAMUEL F. CLARKE, PH. D., . . *Biology*, . . . 1876–1879.
Professor of Natural History, Williams College.

LYMAN B. HALL, PH. D., . . . *Chemistry*, . . 1877–1879.
Professor of Chemistry and Physics, Haverford College, Pa.

A. DUNCAN SAVAGE, B. LITT., . . *Greek*, . . . 1876–1879.
Metropolitan Museum of Art, New York City, 1879–81.

FABIAN FRANKLIN, PH. D., . . *Mathematics*, . . 1877–1879.
Associate in Mathematics, Johns Hopkins University.

CHRISTIAN SIHLER, PH. D., . . *Biology*, . . . 1877–1879.
Physician, Cleveland, Ohio.

FRANCIS G. ALLINSON, PH. D., . *Greek and Sanskrit*, 1877–1880.
Assistant Professor of Greek and Latin, Haverford College, 1880–82; Classical Instructor, Baltimore.

MAURICE BLOOMFIELD, PH. D., . *Sanskrit and Greek*, 1878–1879.
Associate in Sanskrit, Johns Hopkins University.

CONSTANTINE FAHLBERG, PH. D., . *Chemistry*, . . 1878–1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.

EDWIN H. HALL, PH. D., . . . *Physics*, . . . 1878–1880.
Instructor in Physics, Harvard University.

EDWARD COLES HARDING, A. M., . *Greek*, . . . 1878–1879.
Professor of Greek, University of Louisiana, 1879–80.

ISAAC OTT, M. D., ... *Biology*, . . . 1878–1879.
Physician, Easton, Pa.

HENRY SEWALL, PH. D., . . . *Biology*, . . . 1878–1879.
Professor of Physiology, University of Michigan.

WASHINGTON I. STRINGHAM, PH. D., *Mathematics*, . . 1878–1880.
Professor of Mathematics, University of California.

ABRAM V. E. YOUNG, PH. B., . . *Chemistry*, . . 1878–1880.
Student of Chemistry, Paris, France.

CHARLES R. HEMPHILL, A. M., . *Greek*, . . . 1878–1879.
Professor, Theological Seminary, Columbia, S. C.

ALLAN MARQUAND, PH. D., . . *Logic and Ethics*, . 1877–1880.
Lecturer on Modern Logic and Tutor in Latin, Princeton College.

CHARLES A. VAN VELZER, S. B., . *Mathematics*, . . 1878–1881.
Instructor in Mathematics, University of Wisconsin.

BROWN AYRES, S. B., . . . *Physics*, . . . 1879–1880.
Professor of Physics, University of Louisiana, New Orleans.

LOUIS BEVIER, PH. D., . . . *Greek*, . . . 1879–1881.
Student of Philology, University of Bonn.

EDWARD M. HARTWELL, PH. D., . *Biology*, . . . 1879–1881.
Physician, Cincinnati, Ohio.

JOHN R. MCD. IRBY, PH. D., . . *Mineralogy*; . . 1879–1880.
(*Died, March* 25, 1880, *aged* 25 *years*).

MITSURU KUHARA, PH. D., . . *Chemistry*, . . 1879–1881.
Curator of the Scientific Museums, University of Tokio, Japan.

OSCAR H. MITCHELL, PH. D., . . *Mathematics*, . . 1879–1882.
Professor of Mathematics, Marietta College.

EDWARD L. NICHOLS, PH. D., . . *Physics*, . . . 1879–1880.
Professor of Physics and Chemistry, Central University, Richmond, Ky.

WALDO S. PRATT, A. M., . . *Aesthetics, etc.*, . 1879–1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.

WILLIAM T. SEDGWICK, PH. D., . *Biology*, . . . 1879–1880.
Associate in Biology, Johns Hopkins University.

HERMANN VOORHEES, C. E., . . *Chemistry*, . .
(*Died without entering on the Fellowship, October* 14, 1879, *aged* 27 *years*).

CHARLES O. WHITMAN, PH. D., . *Biology*, . . .
Professor of Zoölogy, University of Tokio, Japan, 1879–81; Marine Station, Naples, 1881–82. (*Resigned*, 1879, *before entering on the Fellowship*).

EDMUND B. WILSON, PH. D., . . *Biology*, . . . 1879–1881.
Assistant in the Biological Laboratory, Johns Hopkins University, 1881–82.

GEORGE F. NICOLASSEN, PH. D., . *Greek*, . . . 1879–1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.

WILLIAM BURNEY, PH. D., . . *Chemistry*, . . 1879–1880.
Professor of Chemistry, South Carolina College.

ROBERT W. PRENTISS, S. B., . . *Mathematics*, . . 1879–1881.
Office of U. S. Nautical Almanac, Washington, D. C.

JAMES W. BRIGHT, PH. D., . . *Teutonic Languages*, 1880–1882.
Assistant in German, Johns Hopkins University.

BENJAMIN C. BURT, A. M., . . *Philosophy*, . . 1880–1881.
Assistant Professor of English and Rhetoric, University of Michigan.

SPENCER H. FREEMAN, A. M., . . *Physics*, . . . 1880–1882.
Professor of Physics, Adelbert College, Cleveland, Ohio.

KAKICHI MITSUKURI, PH. B., . . *Biology*, . . . 1880–1881.
Lecturer on Zoölogy, University of Tokio, Japan.

BERNARD F. O'CONNOR, B. ÈS LETT., *Romance Languages*, 1880–1882.
Fellow by Courtesy, Johns Hopkins University.

CHASE PALMER, PH. D., . . . *Chemistry*, . . 1880–1882.
Assistant in Chemistry, Massachusetts Institute of Technology, Boston.

HERBERT M. PERRY, A. B., . . *Mathematics*, . . 1880–1882.
New Ipswich, N. H.

WILLIAM L. ROWLAND, S. B., . . *Chemistry*, . .
(*Did not enter upon the Fellowship*, 1880).

EDWARD H. SPIEKER, PH. D., . . *Greek*, . . . 1880–1882.
Assistant in Greek and Latin, Johns Hopkins University.

MORRISON I. SWIFT, A. B., . . *Philosophy*, . . 1880–1882.
Ashtabula, Ohio.

ARTHUR W. WHEELER, A. B., . *Physics*, . . . 1880–1881.
(*Died, January* 6, 1881, *aged* 21 *years*).

R. DORSEY COALE, PH. D., . . *Chemistry*, . . 1880–1881.
Assistant in Chemical Laboratory, Johns Hopkins University.

A. F. WILHELM SCHIMPER, PH. D., *Biology*, . . . 1880–1881.
University of Bonn, Germany.

LAWRENCE B. FLETCHER, PH. D., . *Physics*, . . . 1880–1881.
Instructor in Physics, Wesleyan University, Middletown, Conn.

WILLIAM J. ALEXANDER, A. B., . *Greek*, . . . 1881–

EDWARD S. BURGESS, A. B., . . *Greek*, . . . 1881–1882.
Instructor, Washington (D. C.) High School.

WILLIAM J. COMSTOCK, PH. B., . *Chemistry*, . . 1881–1882.
Student of Chemistry, University of Munich.

WILLIAM C. DAY, A. B., . . . *Chemistry*, . . 1881–

HENRY H. DONALDSON, A. B., . . *Biology*, . . . 1881–

WILLIAM P. DURFEE, A. B., . . *Mathematics*, . . 1881–

GEORGE S. ELY, A. B., . . . *Mathematics*, . . 1881–

J. FRANKLIN JAMESON, PH. D., . *History*, . . . 1881–1882.
Assistant in History, Johns Hopkins University.

C. HERSCHEL KOYL, A. B., . . *Physics*, . . . 1881–

HENRY L. OSBORN, A. B., . . *Biology*, . . . 1881–1882.

HENRY N. STOKES, S. B., . . . *Biology*, . . . 1881–

BENJAMIN W. WELLS, PH. D., . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I. (*Resigned, Oct.*, 1881).

BENJAMIN I. GILMAN, A. M., . . *Logic*, . . . 1881–1882.
Fellow by Courtesy, Johns Hopkins University.

CHARLES J. BELL, A. B., . . . *Chemistry*, . .
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (*Did not enter upon the Fellowship*, 1882).

JAMES M. CATTELL, A. B., . . *Philosophy*, . . 1882–

ELLERY W. DAVIS, S. B., . . *Mathematics*, . . 1882–

DAVID T. DAY, A. B., . . . *Chemistry*, . . 1882–

ALFRED EMERSON, PH. D., . . *Greek*, . . . 1882–

WILLIAM S. FLEMING, A. B., . . *Greek*, . . . 1882–

ARTHUR L. FROTHINGHAM, . . *Shemitic Languages*, 1882–

HENRY R. GOODNOW, A. B., . . *Physics*, . . . 1882–

ELGIN R. L. GOULD, A. B., . . *History*, . . . 1882–

ARTHUR S. HATHAWAY, S. B., . . *Mathematics*, . . 1882–

WILLIAM H. HOWELL, A. B., . . *Biology*, . . . 1882–

ARTHUR L. KIMBALL, A. B., . . *Physics*, . . . 1882–

HARRY F. REID, A. B., . . . *Physics*, . . . 1882.
Assistant in Physics, Johns Hopkins University.

EDWARD H. KEISER, S. B., . . *Chemistry*, . . 1882–

C.

Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan.

THOMAS CRAIG. (F).
C. E., Lafayette, 1875.—Associate in Mathematics, Johns Hopkins University.

JOSIAH ROYCE. (F).
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.

ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate in Sanskrit, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.

GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Instructor in Post-Graduate Mathematics, Princeton College.

EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.

WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Technology, 1876.—Electrician, Boston, Mass.

HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.
Engaged in mercantile pursuits, Baltimore.

CHASE PALMER. (F).
Assistant in Chemistry, Massachusetts Institute of Technology.

EDWARD HENRY SPIEKER. (F).
Assistant in Greek and Latin, Johns Hopkins University. (3)

F. Holders of Fellowships.

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.

FABIAN FRANKLIN. (F).
Ph. B., Columbian, 1869. –Associate in Mathematics, Johns Hopkins University.

EDWIN HERBERT HALL. (F).
A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.

ALLAN MARQUAND. (F).
A. B., Princeton, 1874.—Lecturer on Logic, etc., Princeton College.

WASHINGTON IRVING STRINGHAM. (F).
A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF.
Assistant, Library of Peabody Institute, Baltimore.

ALLEN KERR BOND.
M. D., University of Maryland, 1882.—Physician, Baltimore.

WILLIAM CATHCART DAY. (F).
Fellow, Johns Hopkins University.

HENRY LAURENCE GANTT.
Instructor, McDonogh School.

EDGAR GOODMAN.
LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER.
Student of Theology, Virginia Theological Seminary.

ALEXANDER FRIDGE JAMIESON.
Instructor, Trenton, N. J.

EDMUND ALLEN JARVIS.
Died, October 15, 1880, aged 22 years.

STEWART BRIAN LINTHICUM.
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

JOHN HANSON LOWE.
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

LEIGH CLINTON MORGAN.
Clergyman, Bunker Hill, W. Va.

NELSON PALMER.
Baltimore.

THOMAS PETTIGREW.
Creswell, N. C.

HARRY FIELDING REID. (F).
Assistant in Physics, Johns Hopkins University.

WILTZ RAYMOND STRICKLEN.
Clergyman, Arlington, Md.

LEWIS WEBB WILHELM.
Graduate Scholar, Johns Hopkins University. (16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F).
A. B., Rutgers, 1878.—Student of Philology, University of Bonn.

ROBERT DORSEY COALE. (F).
Assistant in Chemistry, Johns Hopkins University.

EDWARD ALLEN FAY.
A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F).
A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University.

SAMUEL GARNER.
A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.

EDWARD MUSSEY HARTWELL. (F).
A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Physician, Cincinnati, O.

WILLIAM THOMPSON SEDGWICK. (F).
Ph. B., Yale, 1877.—Associate in Biology, Johns Hopkins University.

CHRISTIAN SIHLER. (F).
Concordia, 1866.—Physician, Cleveland, O.

EDMUND BEECHER WILSON. (F).
Ph. B., Yale, 1878.—Late Assistant in Biology, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN.
Student of Law, University of Maryland.

HENRY JOHNS BOWDOIN.
Student of Law, University of Maryland.

JOHN WILSON BROWN.
Baltimore.

DAVID TALBOTT DAY. (F).
Fellow, Johns Hopkins University.

WILLIAM HENRY HOWELL. (F).
Fellow, Johns Hopkins University.

JOHN JOHNSON.
Instructor, McDonogh School.

JAMES EDWARD KEELER.
Assistant, Allegheny (Pa.) Astronomical Observatory.

EDWIN GEORGE RICHARDSON.
Clergyman, Newark, N. J.

ADONIRAM JUDSON ROBINSON.
Graduate Student, Johns Hopkins University.

HENRY ROLANDO.
Student of Medicine, University of Maryland.

LEE SALE.
Student of Law, Louisville, Ky.

MACTIER WARFIELD.
Student of Medicine, University of Maryland. (12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F).
A. B., Lafayette, 1877.—Assistant in German, Johns Hopkins University.

JOHN FRANKLIN JAMESON. (F).
A. B., Amherst, 1879.—Assistant in History, Johns Hopkins University.

MITSURU KUHARA. (F).
S. B., University of Tokio, 1877.—Curator of the Museums, University of Tokio.

ROBERT W. MAHON.
C. E., Lehigh, 1876.—Tutor in Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).
A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).
A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.
A. B., Iowa, 1879.—Assistant Professor of Chemistry, University of Minnesota.

CHASE PALMER. (F).
A. B., Johns Hopkins, 1879.—Assistant in Chemistry, Mass. Institute of Technology.

EDWARD HENRY SPIEKER. (F).
A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.
Student of Law, University of Maryland.

THOMAS ALEXIS BERRY.
Pursuing his studies in Germany.

GUSTAV BISSING.
Graduate Scholar, Johns Hopkins University.

WALTER BERNARD CLARKSON.
Principal, Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.
Instructor, Bloomfield, N. J.

LOUIS GARTHE.
Graduate Student, Johns Hopkins University.

EDWARD INGLE.
Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.
Student of Law, University of Maryland.

GUSTAV ADOLPH LIEBIG, JR.
Graduate Student, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER.
Graduate Scholar, Johns Hopkins University.

JAMES PAGE.
Graduate Student, Johns Hopkins University.

ALBERT GALLATIN PALMER.
Graduate Student, Johns Hopkins University.

ROBERT MILLER REESE.
Baltimore.

LEWIS TEBBETTS STEVENS.
Graduate Scholar, Johns Hopkins University.

HERBERT THORNDYKE TIFFANY.
Graduate Student, Johns Hopkins University. (15)

TOTAL (1878-82.)

DOCTORS OF PHILOSOPHY, ...	33
BACHELORS OF ARTS, ...	46

D.

System of Fellowships.

Twenty fellowships are annually open to competition in this university, each yielding five hundred dollars and exempting the holder from all charges for tuition.

OBJECT OF THE FOUNDATION.

The system of fellowships was instituted for the purpose of affording to young men of talent from any place an opportunity of continuing their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions (though such persons have not been formally excluded from the competition), but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the president of the university to the executive committee, and by them to the trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and desirable posts in different parts of the country.

The number of applications for fellowships has hitherto been very large, and it may have happened that some candidates have failed of appointment who were really superior to those selected. But, if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the university merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that graduate students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but the absence of candidates from Baltimore has been no bar to their appointment, in cases where adequate evidence of their claims has been presented.

Regulations.

1. The application must be made in writing.

2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.

3. The value of each fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the fellowship, payments will be made for the time during which the office shall have been actually held.

4. Every holder of a fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the university, as circumstances may suggest. He must reside in Baltimore, during the academic year.

5. He will be expected to devote his time to the prosecution of special study (not professional), with the approval of the president, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.

6. He may give instruction, with the approval of the president, by lectures or otherwise, to persons connected with the university, but he may not engage in teaching elsewhere.

7. He may be re-appointed at the end of the year.

8. The appointments are usually made as follows:

In mathematics, three; chemistry, three; physics, three; biology, three; Greek, three; other subjects, five.

9. *Applications for the next year should reach the university before May* 11, 1883.

E.

The Johns Hopkins University as a Place for College Students.

[Reprint of a University Circular, issued May 12, 1882, referred to at page 11].

The Johns Hopkins University invites the attention of the residents of Maryland and of the adjacent region, and especially of the citizens of Baltimore, to the opportunities here afforded for acquiring a college training.

The reputation which the university has gained at a distance, as well as at home, by the work which its teachers have done in the advancement of science, and by the publications which it has encouraged, diverts the attention of casual observers from the advantages offered in its collegiate instruction. Even the public lectures given by resident and non-resident professors, have been so generously reported in the newspapers, that they sometimes appear as the principal work, and not in their true aspect as courses auxiliary and subordinate to the ordinary instruction.

The trustees have always been mindful that they were to maintain a university for the advanced education of youth fitted for such higher training, and they have been gratified to observe how soon the advantages here offered were appreciated in distant regions by young men who have come to Baltimore in considerable numbers for the prosecution of their studies.

But from the beginning, the authorities have held to the belief that university instruction depends upon collegiate; and that a good university must either include a college, or must be so placed that it can influence and attract the students of colleges independently maintained. Some generous person, desiring to add still greater attractions to the city for which Peabody, Hopkins, and Pratt have done so much, might well endow a college for young men, another might endow a college for young women,—and both such foundations, whether affiliated with the Johns Hopkins University, or independent of it, might derive extraordinary advantages from its neighborhood, and from the professors, the collections, the laboratories, and the other agencies which the university will provide.

At present, however, this university, in addition to what it offers to graduates and others who are prepared for advanced study, maintains instruction for undergraduate students, candidates for the customary degree of bachelor of arts. While admitting that there are advantages offered by older institutions which cannot at once be provided in a new place, we may claim that there are other advantages which this institution possesses in its freedom from restrictions, in its ample funds, and in its readiness to adopt those regulations which the experience of older institutions has proved to be desirable, though they are not always practicable where routine and usage have long prevailed.

Let us consider some of these points. Of late years, there has been a great deal of discussion respecting the proper plan of study to be recommended to young men who seek a liberal education. Much can be said in favor of prescribing one course to be followed by all who look towards the baccalaureate degree. Usage is in its favor; so is economy; so is the testimony of many wise men who have had this training and who know its value. On the other hand, the number of modern sciences which call for recognition is so large, and the attainments exacted by the various callings of modern society are so numerous and diverse, that it is really a difficult matter to decide between conflicting claims. In some places, freedom of choice on the part of every student is permitted; elsewhere, some of the studies are required of all students and others are optional,—the extent to which option is allowed varying very much; in other places scientific colleges are maintained by the side of classical colleges; and again there are institutions which continue to allow no choice whatever and provide but one course for all.

The plan adopted in Baltimore is this. No distinction is made between the scientific departments and what has elsewhere been called "the college proper"; all the courses lead to one and the same degree (bachelor of arts) and are intended to be equally difficult, and to require an equal amount of time. The standard of matriculation, alike for all students, is somewhat higher than is common in American colleges, in order that as much as possible of preliminary discipline may be acquired in the preparatory schools. But this training can be readily obtained in the best schools of Baltimore, or with private resident teachers. All who

desire to take an academic degree are expected "to matriculate." After doing so, they have some degree of choice but not absolute freedom. In accordance with parental advice and with the counsel of a member of the faculty who acts as an Adviser, every student must decide upon one of several combinations of study which are offered to him. The combinations may be named as follows: I. Classical; II. Mathematical; III. Literary; IV. Scientific; V. Preliminary to Medicine; VI. Preliminary to Theology; VII. Preliminary to Law.

The dominant character of each course may be inferred from its designation, but a more definite notion can be acquired from the official register, which is annually published. Without repeating the details, it may be said that the scholar who successfully goes through any one of these combinations of study should during its progress have shown that he has at least the usual collegiate proficiency in algebra, geometry, trigonometry, and analytical geometry; in English, French, German, Latin, and Greek (unless excused in the last named subject to gain more time for scientific studies); physics or chemistry or both; and in some branches of history and philosophy.

The time required to complete any of these courses may be three or four years; or it may be less if the student comes with attainments beyond what are demanded for matriculation, or if he is favored by the possession of unusual ability. He is not kept back by the ordinary class-system. He proceeds at a slower or a more rapid rate according to circumstances.

It is obvious that to give efficiency to these arrangements a large staff of teachers is requisite. There are at present not less than twenty-seven who take some part in the instruction of undergraduate students, and as the teaching staff is large in proportion to the number to be taught, the scholars have a corresponding advantage. They are individually well known to their instructors and are brought into familiar relations with them, so that their various intellectual needs secure personal attention.

The presence of a company of older and more advanced students in the university exerts a strong influence upon under-graduates. The whole establishment becomes a laboratory where every body is busy, and where enthusiasm in study is the predominant characteristic. Minute regulations are not often called for,

because the interest awakened in pursuits which the scholar himself has chosen, secures application and industry on the part of nearly all; and the few who are indifferent to the advantages afforded them soon drop out of the ranks.

Personal acquaintance with one and another advanced student leaving our halls to assume a position of usefulness and honor, acts as a powerful stimulant upon those who are still in an earlier stage of discipline. They see what results follow devotion to study. Moreover the graduate students come from widely different regions, tending to make this university a national institution; so that, while its aggregate attendance is not as yet very large, it includes men of diverse antecedents, training, and expectations, and leads to that knowledge of human nature and of civil society which comes from an acquaintance with men of widely different circumstances. The poor and the rich, the city boy and the country boy, the foreigner and the native, the quick and the slow, the lover of books and the lover of experiment, are brought together in the same class rooms, laboratories, and societies, in walks, in sports, in religious and charitable duties, and in all the associations of academic life.

Professor Dunbar, Dean of the Harvard Faculty, recently made the following remark in respect to the influence of university students upon those of a college:

. . . ."All students in College, it is believed, feel the effect of a more stimulating intellectual atmosphere, created by the presence and example of persons engaged in the highest pursuits. Both as regards the intellectual activity of students and the quality of the instructing body, the vigorous life of the *College* hereafter is to be promoted most effectively by the building up of a broad and solid structure of *University* work."

A still stronger, though perhaps a less obvious influence is exerted upon collegiate students by the certainty that their teachers are known in the world at large as contributors to the advancement of knowledge. The presence of a renowned professor is felt beyond the limited circle of those who follow his appointed lectures. All members of the university are influenced by his methods of investigation and by his publications, and they almost feel entitled to share in the honors which he gains.

Among the minor usages which has found favor in this university is the employment of paid examiners, (who have had no part in

the instruction of the classes), to set papers and mark the answers in special branches of study. The teacher also examines his class,—but when a second paper is set by the university examiner, the scholar is aware that his attainments are to be tested by two standards,—that of his instructor, with whose methods he is of course familiar, and that of another judge whose lessons he has never followed. The trial is severe, but its disciplinary influence is good.

Again, the private reading of standard and classical authors is encouraged by the instructors in ancient and modern languages, history, philosophy, etc.;—and examinations are held from time to time in order that the scholar may receive credit on the record books of the university for work which is thus carried on independently of the class-room recitations. Such reading is often found profitable in the long vacation of summer. A wider acquaintance with good writers may thus be attained than it is possible to secure in the ordinary limitations of a class; individual tastes may to some extent be followed in the selection of books, and a degree of proficiency may be acquired which will tend to give the student more opportunity, in term time, for work which can only be done in a laboratory or under a teacher's eye.

There is one of the combination of studies above referred to which calls for a few special words of comment,—the group preliminary to medical studies. Opportunities are here afforded to a young man, who expects at a later day to take up the study of medicine, to become proficient in laboratory work while acquiring a knowledge of German and French and continuing his general education. A course is arranged in which physics for the first year, chemistry for the second, and the biological study of plants and animals for the third year, are the dominant topics. At the close of this course the student should have become proficient in a knowledge of the physical and chemical laws which underlie the conditions of life; he should have become familiar with the structure and functions of living beings in their normal and healthy condition; he should have become skilful in the use of the microscope and other physiological apparatus; and so when he enters the school of medicine he should know that he has been well prepared for the study of disease and of its treatment, by a training in fundamental sciences, which has not only exercised his eye and

hand but has accustomed his mind to accurate habits of observation and inquiry.

This combination of studies is recommended to students after passing the full matriculation examination,—but it has so long been customary in this country for the medical colleges to receive students without requiring of them any preliminary examination whatsoever, that for a time it is thought best to receive to this course of preliminary training students who are not at their admission prepared for the full matriculation. A special examination is therefore appointed for such as wish to enter upon a three years course of scientific studies, without expecting to take the degree of bachelor of arts.

The authorities of the university are mindful that there are many persons in Baltimore who desire to avail themselves to a certain extent of the advantages of a university without becoming fully matriculated students or candidates for a degree. So far as it is possible without interfering with the requirements of regular students and with the necessary engagements of the professors, the effort has been made to extend the university influence in this community, by lectures given in Hopkins Hall, by teachers' classes, and by occasional courses in different parts of the city. It may not be as well known that students who can give good evidence of being fitted to profit by the lessons here given are permitted to receive instruction in those branches which they are ready to pursue. There is an obvious danger in this permission, against which the faculty must be on its guard. A youth is often disposed to avoid that which seems to him "hard," and to choose an easy path; or, sometimes, he only cares to be enrolled in a respectable college without having any desire to study. It is not for such cases that this permission is designed. Nor is it intended to imply that, as a general rule, the study of one or two subjects is the proper way of acquiring a liberal education. Nevertheless, experience shows that there are in every community some who are not able, for one reason or another, to pursue a prolonged and systematical plan of instruction, but who have decided talents and are disposed to make good attainments in a more limited sphere. To such as these the door of the Johns Hopkins University has never been closed; indeed, among the students of this class, many young men of excellent ability and promise have been found,

and some who began as "special students" have afterwards matriculated and graduated with honor.

The charges for tuition are lower than is customary in institutions of corresponding rank, being forty dollars for each half year. The only additional fees are those required in the laboratories for materials consumed. The founder of the university requested that scholarships should be awarded to young men from Maryland, Virginia, and North Carolina who are found worthy, and accordingly such scholarships yielding free tuition are annually open to those who wish for this aid in the prosecution of their studies. Seventy persons have already enjoyed this advantage. The trustees have extended this privilege to residents of the District of Columbia.

Parents at a distance are sometimes afraid to send their sons to a city. If they will take the pains to inquire they will ascertain that most of the temptations to which youth are exposed may be found in the neighborhood of country colleges as well as in large towns. Wherever young men are congregated they need to be on their guard against open as well as insidious allurements by which their physical, intellectual, and moral natures may be impaired for life; and every right-minded teacher must feel the responsibility of guiding those who come under his influence in the paths of rectitude. But the arrangements of the Johns Hopkins University are favorable to good conduct. The students dwell in families resident in widely separated parts of the city. They are governed by the social, moral, and religious influences of the homes to which they belong. While assembled in the university they are brought into constant relations with their teachers. An attractive library is open to them without interruption all the day long. There are gymnasiums, not very far distant, to which they may resort for physical culture and entertainment. There are numerous societies and clubs to many of which the teachers belong. All these circumstances have been favorable, it is believed, not only to the preservation of good order, but to the formation of good habits.

The Johns Hopkins University is an unsectarian foundation. Like the city in which it is placed, it includes among its members those whose opinions and beliefs are widely divergent. But it is not an irreligious foundation because it assumes no distinctive

name. It inculcates the love of truth, not only in the daily relations of man to man, but in the defence of opinions, in the prosecution of research, and in the formation of mental habits. It insists upon uprightness of conduct in all its members. Yet in accordance with the usages of other well known colleges, which commonly bear denominational names, it lays down no test or creed for the assent of students or professors. The trustees have expressed a desire to see the university pervaded by a spirit of enlightened Christianity; the ethics taught is Christian ethics; the daily religious service is Christian worship; but the abundance and diversity of churches in this community make it quite inexpedient for the university to become identified with any one religious body. Its officers and students are of many denominations, and maintain the relations which their own consciences approve.

The number of students from Baltimore who have availed themselves of the privileges of the Johns Hopkins University is two hundred and four. Of this number, sixty-nine entered as graduate students, sixty-nine have followed courses as matriculates, and sixty-six as undergraduate special students. Twenty-nine of the matriculates have already gone forward to the degree of bachelor of arts after passing the requisite examinations.

A considerable number of these recent graduates still remain here and are pursuing their studies in languages, science, history, etc., in order that they may be fitted for the degree of doctor of philosophy, for which they can become candidates; or that they may be better qualified for the professional studies which they expect to take up. Four who were undergraduates a few years ago have already been appointed fellows, which is the highest honor bestowed by the university upon a student. Others have entered upon the professional study of law, medicine, or theology, and others are engaged in teaching or in business.

F.

List of Foreign Correspondents.

The following list gives the names of the foreign societies and journals with which a regular exchange of publications is made by the university. (See page 69).

GERMANY AND AUSTRIA.

Berlin. Königliche akademie der wissenschaften.
Deutsche chemische gesellschaft.
Jahrbuch über die fortschritte der mathematik.
Journal für reine und angewandte mathematik. (Crelle.)
Cassel. Verein für naturkunde.
Cöthen. Chemiker zeitung.
Giessen. Jahresbericht über die chemie und physik.
Göttingen. Königliche gesellschaft der wissenschaften.
Heilbronn. Literaturblatt f. germ. u. rom. philologie.
Jena. Jenaische zeitschrift für naturwissenschaften.
Leipzig. K. Sächsische gesellschaft der wissenschaften.
Archiv der mathematik und physik. (Grunert.)
Jahrbücher f. classische philologie.
Liebig's annalen der chemie. (Wöhler, Kopp.)
Mathematische annalen. (Clebsch.)
Zeitschrift für mathematik und physik. (Schlömilch.)
Zeitschrift für krystallographie und mineralogie.
Zoölogischer anzeiger.
Munich. Königliche akademie der wissenschaften.
Strassburg. Zeitschrift für physiologische chemie.
Trieste. Κλειω.
Tübingen. Jahresbericht für reine chemie.
Vienna. K.-k. akademie der wissenschaften.
Wiesbaden. Zeitschrift für analytische chemie. (Fresenius.)

FRANCE AND SWITZERLAND.

Cherbourg. Société nationale des sciences naturelles et mathématiques.
Paris. Institut de France: Académie des sciences.
Bureau des longitudes.
École normale superieure.
École polytechnique.
Observatoire de Paris.
Société chimique de Paris.
Société mathématique de France.
Annales de chimie et de physique.
L'astronomie.
Bulletin des sciences mathématiques et astronomiques.
Journal de mathématiques pures et appliquées.
Nouvelles annales de mathématique.
Revue internationale de l'enseignement.
Revue politique et littéraire.
Revue scientifique.

Bern. Schweiz. gesellsch. für die gesammten naturwissenschaften.
Zurich. Société helvétique des sciences naturelles.

Belgium and Holland.

Brussels. Académie des sciences de belgique.
Annales du bibliophile.
Ghent. Mathésis.
Archives de biologie.
Leyden. Nederlandsche dierkundige vereeniging.
Récueil des travaux chimiques des Pays-Bas.
Liége. Société royale des sciences.
Louvain. Le muséon.

Italy; Spain and Portugal.

Milan. Istituto Lombardo di scienze e lettere.
Annali di matematica pura ed applicata.
Naples. Giornale di mathematiche.
Zoologische station zu Neapel.
Palermo. Gazzetta chimica Italiana.
Rome. Reale accademia dei lincei.
Turin. Reale accademia delle scienze.
Archives Italiennes de biologie.
Venice. Reale istituto Veneto.

Coimbra. Jornal de sciencias mathematicas e astronomicas.
Madrid. Novedades cientificas.

Great Britain and Ireland.

Cambridge. Philosophical society.
Dublin. Trinity college.
Edinburgh. Royal society.
London. Royal society.
Royal astronomical society.
Mathematical society.
Chemical society.
Society of telegraph engineers.
Royal institution of Great Britain.
Society of chemical industry.
Chemical news.

Denmark and Norway; Russia and Finland.

Copenhagen. Royal academy.
Tidsskrift for mathematik.
Christiania. Archiv for mathematik og naturvidenskab.
University of Christiania, publications.

St. Petersburg. Académie impériale des sciences.
Helsingfors. Société des sciences de la Finlande.

Greece.

Athens. Παρνασσός.

British India.

Calcutta. Asiatic society of Bengal.

Japan.

Tokio. University, publications of scientific department.

Australia.

Sydney. Royal society of New South Wales.

Mexico.

Mexico. Revista cientifica Mexicana.

Brazil.

Rio de Janeiro. Observatoire impériale.

G.

Report of the Chesapeake Zoölogical Laboratory.

FOR THE FIFTH YEAR.

Summer of 1882, Beaufort, N. C.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request, I have the pleasure to submit the following report of the fifth session of the Chesapeake Zoölogical Laboratory.

The laboratory was opened for work at Beaufort, N. C., on May 1, 1882, and was closed on September 29, after a session of twenty-two weeks.

The following is a list of the scientific workers of the party:

W. K. BROOKS, *Director.*
E. B. Wilson, *Assistant.*
H. L. Osborn, *Fellow J. H. U.*
H. W. Conn, *Graduate Student J. H. U.*
J. M. Tyler, *Prof. of Natural Science, Amherst College.*
J. Pillsbury, *Prof. of Natural Science, Springfield, Mass.*
J. M. Wilson, M.D., *Ann Arbor, Mich.*
Francis Winslow, *Lieut. U. S. N., U. S. Fish Commission.*

Abstracts of the more important investigations have already been printed in the University Circulars, and in the Zoölogischer Anzeiger, and more extended accounts are now in preparation for publication.

The following subjects, among others, have been investigated:

Dr. E. B. Wilson has completed his study of the anatomy, histology, and embryology of Renilla, and I hope that his paper on this subject will soon be published. The work has fully occupied him and Prof. Mitsukuri for three years, and his results, which are of the greatest interest to science, cover so much ground that it is impossible to state them here. He was able this summer to fill all the gaps in his previous work, since he succeeded in obtaining an ample supply of material.

He also obtained the eggs and young of a closely allied form, Leptogorgia, and, by tracing its life history, secured the data for a comparison between Renilla and other compound polyps. As the great number and cost of the engravings render the publication of this paper in this country almost impossible, Dr. Wilson has taken his specimens and drawings to Europe, in order to find means for publication there. He also hopes to complete his work by studying, in the Naples Aquarium, the embryology of Pennatula, a form which can only be obtained on our coast by deep-sea dredging.

Incidentally to this work, Dr. Wilson has published this summer a paper on "Variation in the Early Stages of the Development of Renilla," a subject which he investigated this season, with the help of J. M. Wilson and H. L. Osborn.

Lieut. Winslow and I devoted nearly two months to oyster propagation, and made discoveries which enable us to rear oysters from the egg much more rapidly and with greater certainty than has been possible before; and although we have not yet succeeded in keeping the young oysters until they attach themselves, our experience this year will enable us to construct an apparatus which we have every reason to believe will accomplish this purpose. Our station at Beaufort is so remote from all mechanical resources and appliances that we were not able to construct this apparatus; but we hope to be able to take it with us and put it into operation early next spring.

Mr. Osborn has studied the growth of the shell of the oyster by placing small circles of microscopic glass between the mantle and the shell of the living oyster, and removing them at short intervals to examine the manner in which the new shell is deposited on the glass. He has also been able to make interesting observations upon the rate of growth of the oyster.

His researches on this subject show that, within six weeks after it attaches itself, the oyster may, under favorable circumstances, grow to the length of an inch, or even more. The oysters upon which he experimented were not reared from the egg, but were caught in the open water by a spat-collector.

Mr. Osborn has also studied the anatomy of Balanoglossus, and he expects to continue this work through the winter in Baltimore.

Mr. Conn spent most of the summer tracing the life histories of crabs, and obtained many novel and interesting results.

He also studied the development of the embryo of Tubularia (Parypha) cristata, and has an illustrated paper on this subject now ready for publication. His researches show that the published accounts of the embryology of Tubularian hydroids are incorrect.

Mr. Conn has also demonstrated, by feeding with colored particles, the occurrence of intra-cellular digestion in Tubularia.

He has also made a very thorough study of the embryology of a Gephyrean worm, Thallassima, but another season at the sea-shore will be necessary to complete this work.

Dr. J. M. Wilson has carried on a series of experiments to test the statement that the eggs of Sea-Urchins may develop parthenogenetically, and his results seem to show that the statement is untrustworthy.

My own chief work has been the study of the hydro-medusae of Beaufort, and a monograph on this subject is now in preparation.

I have added a number of new forms to my list this summer, and have traced the life histories of several others. I have also verified Metsch-

nickoff's account of the delamination of the egg of Liriope; and McCrady's account of the development of the parasitic larva of Cunina within the bell of Turritopsis.

As regards my work on the Macroura of Beaufort, I have added a number of new facts, and now have ready for publication an account of the life history of Alpheus minus; an account of Alpheus heterochelis; and of Penaeus Braziliensis. The latter is of especial interest, since I have been able to verify, by actually rearing captive isolated specimens, Fritz Müller's classical memoir on this subject.

Among the more interesting new forms which we have added this year to the fauna of our continent, I may mention Pedicellina and Loxosoma.

Yours respectfully,

W. K. BROOKS.

H.

List of Donors to the Library, September 1, 1881, to September 1, 1882.

ARCHAEOL. INST. OF AMERICA. Papers. Classical Series I. Boston. O.
BRINTON, D. G., M.D. (Author). Books of Chilan Balam. Philadelphia. O.
BRANDT, H. G. C. Preussische Siegeslieder. Heilbronn. D.
BLAKE, E. W. (Author). Solution of the Pyramid Problem. New York. O.
BALLARD, R. (Author). Aerodynamics. New Haven. O.
CORDELL, E. F., M. D. Transactions of Medical and Chirurgical Faculty of Maryland. Baltimore. O.
CENTURY Co. Selected proofs from Scribner's Monthly. New York. F.
CARPENTER, PROF. W. H. (Editor). Nikolasdrapa Halls Prests. Halle. O.
Olafsson, A. Authfrædi. Copenhagen. O.
Olafsson, A. Skirnir. Copenhagen. O.
COOK, G. H., State Geologist, N. J. Annual Report, 1881. Trenton. O.
CASEY, J. (Author). *Sequel to the First Six Books of Euclid.* London. D.
COMMISSIONERS OF PUBLIC SCHOOLS. Baltimore. Report for 1881. Baltimore. O.
COMEGYS, J. P. (Author). Memoir of J. M. Clayton. Wilmington. O.
CONVERSE, J. H. *Subject Index to Library of Baltimore Bar.* Baltimore. O.
DALLAS, E. J. (Compiler). Street Directory of Principal Cities of the United States. Washington. O.
DENNY, H. G. Massachusetts State Record. 5 Vols. Boston. O.
EYRE AND SPOTTISWOODE. (Publishers). Variorum Teacher's Bible. London. O.
ELY, R T. Statistisches Jahrbuch d. Stadt Berlin. Berlin. O.
GILMAN, PREST., D. C. Boerhaave Aphorismi. Leyden. D.
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1876-1882.

The following list includes books and articles published by members of the Johns Hopkins University, written during the connection of the author with the university, or based on work carried on while here. Other papers written by holders of Fellowships are also given. The graduating theses of the doctors of philosophy are also included.

The work of non-resident lecturers is not included.

The journals, etc., issued under the auspices or with the aid of the university, are indicated in the list by the following abbreviations:

American Journal of Mathematics,	*Math. Jour.*
American Chemical Journal,	*Chem. Jour.*
American Journal of Philology,	*Philol. Jour.*
Studies from the Biological Laboratory,	*Biol. Studies.*
Journal of Physiology,	*Jour. of Physiol.*
Contributions to Logic,	*Logical Contributions.*
Studies in Historical and Political Science,	*Hist. and Pol. Studies.*
Johns Hopkins University Circulars,	*Univ. Circulars.*

Where an article has appeared in more than one of the journals above named, its principal place of publication alone is generally given. As a full index of the abstracts of scientific papers in the University Circulars has recently appeared, only a portion of the papers there published are here noted.

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On irresoluble numbers not containing factors of the form $6n + 1$.
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On the trisection and quartisection of the roots of unity to a prime number index.
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This Report covers the Academic year ending September 1, 1882. The Appendix contains some statements of a more recent date.

Issued November 11, 1882.

1883

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OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore, Maryland

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1882-83.

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Eighth Annual Report.

To the Trustees of the Johns Hopkins University:

In the report of this university presented a year ago, there was an extended statement of the principles which had been observed and of the results which had been reached in the development of our work from 1876 to 1882. The following year, which closed on the first of September, 1883, has been one of prosperity and growth. All the chief departments of investigation and instruction hitherto established have been maintained with fidelity and success. Some new subjects have been introduced. The number of teachers and of students has increased, the buildings have been enlarged, the books and apparatus have been added to, and the recognition which the university has received at home and abroad has been more encouraging than ever.

During the summer vacation I had the pleasure of visiting a number of foreign universities, and of learning something of the recent progress of education in England and on the continent. Wher-

ever I went, it appeared that one department or another of our work was well known to scholars. The subject of medical education and the management of hospitals, especially in their relations to medical teaching, occupied much of my attention, and I owe a public acknowledgment to gentlemen in London, Oxford, Cambridge, Manchester, Leyden, Amsterdam, Bonn, Heidelberg, Freiburg, Zurich, and Paris, for information, suggestions and printed statements pertinent to this and to other branches of university administration. In different lands, the principles of superior education are under discussion, and earnest efforts are making to improve existing methods for the promotion of knowledge and the training of scholars. In some places our progress is watched with attention and expectation. At home during the past year our methods have been subjected to the closest scrutiny.

Under all these circumstances, I have been more than ever impressed by a sense of the responsibilities which rest upon those who are guiding this new institution. We are not only bound to have good intentions; we must have wisdom; and in order that we may be wise we must continually study the opinions of the most enlightened men in the most enlightened universities at home and abroad. Many years ago a celebrated English scholar, referring to the weighty office of those

"on whom it falls to found and put in action new institutions of liberal education, intended to meet the requirements of present and future ages," declared that "those who are engaged in this task must act as men building for eternity." As we notice in our seven years history, how rapidly ways become customs, and customs, laws; and observe in the old world, how hard it is to depart from laws once put in force; the words of Whewell, which have just been quoted, will hardly seem too strong.

We continue to maintain the principle that the chief function of a university is to develop the character of its students, by bringing them into personal relations with leaders in the different branches of knowledge. Instruction by books, by correspondence, or by telephone, can never accomplish what is attained by the encounter, face to face, of a master and his scholars. Nor can intellectual be separated from moral character. Strong, true, learned, faithful, honest teachers, will make of their pupils well developed men, and these men will become leaders in professional life, scholars, writers, investigators, thinkers, philosophers, or men of affairs, according to their inborn gifts and the power of will which they firmly apply in their several vocations. The training of all that is spiritual and humane, the steady and harmonious unfolding of the minds of youth, under the friendly

observation and suggestions of a teacher, are therefore of paramount importance in our work.

But almost inseparable from this function of the University, is the duty of advancing human knowledge, and of bringing before the world the results of continued thought upon important themes. It is natural and right that the public should look to universities for light. All man's inheritance from the past, language, literature, politics, religion, should be studied, that none of the dearly bought experience of the race may be lost. Liberal means should also be provided for the prosecution of all the branches of scientific research. The results of such investigations should be communicated to the world by lectures, books, and memoirs, and the university should encourage the printing of original and important work on subjects too recondite for the ordinary means of publication. In this work of investigation and research, every university should take some part, and indeed the amount of its contributions to the general stock is not an unfair measure of its force. This university desires to do its part for the advancement of knowledge. While providing the incentives of association and opportunity, of books, instruments, laboratories, and the means of printing,—it also brings to bear upon all its staff the obligation of Duty, the duty of liberally educated men to do all they can for the good of mankind.

The phrase "promotion of research," which it is the fashion to employ in these days, meets with an opposition which was never encountered by the phrase "advancement of knowledge," and yet both phrases mean the same thing. It requires but a very slight acquaintance with the times in which we live, to see that the progress of modern civilization is due to the use of scientific methods, and that innumerable problems pertinent to the highest welfare of the human race remain unsolved because they have never been studied in this painstaking way.

From these preliminary considerations I pass to a report of the current year, beginning with the work of instruction of graduate and undergraduate students. Those who are disposed to look into these subjects more closely are reminded that, for the information of the public, detailed statements of the work here in progress are constantly printed in our official Circulars.

Numerical Statements.

Classes have been taught in the various branches of higher mathematics, in chemistry and mineralogy, physics, biology, (including physiology and comparative anatomy); in history, political economy, ethics, logic, and psychology; in Greek, Latin, Hebrew, Sanskrit, French, Italian, Spanish,

German, Anglo-Saxon, and English. Sixteen young men completing their courses of study, and passing the requisite examinations, have come forward to take their degrees.

The academic staff included during the year forty-one teachers, four of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and four, of whom one hundred and six were residents of Maryland, and ninety-one came here from twenty-eight States of the Union, and seven from foreign countries. Among the students were one hundred and twenty-five already graduated, coming from sixty-seven colleges and universities; there were forty-nine matriculates, (or candidates for the degree of bachelor of arts), and there were thirty admitted as special students, to pursue courses of study for which they seem fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged one hundred and forty-eight,—ascertained by the count of the doorkeeper. The number of students at the opening of the present academic year is two hundred and thirty-three, of whom one hundred and forty-eight are already graduates.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non-Matriculates.	Total Enrolled.	Average attendance at Public Lectures.
1876–77	54	12	23	89	60
1877–78	58	24	22	104	84
1878–79	63	25	35	123	96
1879–80	79	32	48	159	118
1880–81	102	37	37	176	186
1881–82	99	45	31	175	137
1882–83	125	49	30	204	148
*1883–84	148	52	33	233	

*As shown by the preliminary list at the opening of the academic year.

The attendance upon some of the principal courses during the last five years has been as follows:

	1878–79.	1879–80.	1880–81.	1881–82.	1882–83.
Mathematics,	38	31	31	33	35
Physics,	32	38	35	42	50
Chemistry,	39	46	40	44	49
Biology,	26	32	25	32	30
Greek,	40	36	31	33	44
Latin,	27	40	40	39	41
German,	55	60	55	47	50
French, Italian, etc.,	18	39	33	26	31
English,	*	19	29	22	45
History and Polit. Sci.,	19	33	40	40	64
Logic,	6	16	13	9	14
Philosophy and Ethics,	6	12	14	22	47

*Not recorded.

From the printed registers of the last seven years, it appears that five hundred and thirty-seven individuals have been here enrolled as

students, of whom two hundred and eighty-five have come from Maryland, (including two hundred and thirty from Baltimore), and two hundred and fifty-two from thirty-nine other states and countries. Of this number three hundred and thirty persons pursued courses as graduate students and two hundred and seven as collegiate students.

MATHEMATICS.

The subject of mathematics has received great encouragement from the Trustees ever since the university was opened. As there are reasons for anticipating the withdrawal from our staff of Professor Sylvester,* the leader in this work, it may be of interest at the present time to recall the subjects which have here been taught since he came among us.

Of those who have held fellowships two are on the staff of instructors of this university, eight received appointments at other universities and colleges, two are filling positions in the scientific bureaus of the U. S. government at Washington, and one is teaching in a private school. This includes all the former fellows in mathematics. Of the former graduate students, not fellows, two at least have been appointed to collegiate profes-

* His resignation was accepted by the Trustees October 1, 1883. In December following he was appointed Savilian Professor of Geometry in the University of Oxford.

sorships. The Mathematical Seminary has held monthly meetings since October, 1878, and the graduate students, more particularly the fellows, have taken an active part in its proceedings, the papers read by them generally indicating a high order of ability and mastery of the subject under discussion. Since November, 1879, abstracts of thirty-five such communications have been published in the University Circulars, viz: eleven in 1879–80, seven in 1880–81, six in 1881–82, and eleven in 1882–83. In addition to this, former fellows and scholars have published, since their first connection with the university, forty-six mathematical papers in various periodicals.

Dr. Story, Associate Professor, has furnished me with the following additional statement:

COURSES OF INSTRUCTION, HOURS PER WEEK, AND ATTENDANCE, 1876–83.

Graduate Courses.

Determinants and Modern Algebra: Professor Sylvester, 1876–77, 2d half-year, 2 hrs., (7); 1877–78, 2 hrs., (5); 1878–79, 2 hrs., (8).

Theory of Numbers: Professor Sylvester, 1879–80, 2 hrs., (8); 1880–81, 2 hrs., (6); 1881–82, 1st half-year, 2 hrs., (7).

Theory of Partitions: Professor Sylvester, 1882–83, 2d half-year, 2 hrs., (10).

Algebra of Multiple Quantity: Professor Sylvester, 1881–82, 2d half-year, 2 hrs., (12); 1883–84, 1st half-year, 2 hrs., (6).

Theory of Substitutions: Professor Sylvester, 1882–83, 1st half-year, 2 hrs., (9).

Algebraical Geometry and Abelian and Theta Functions: Professor Cayley, 1881–82, 2d half-year, 2 hrs., (14).

Quaternions: Dr. Story, 1877–78, 2 hrs., (2); 1879–80, 3 hrs., (4); 1881–82, 3 hrs., (7); 1882–83, 2d half-year, 3 hrs., (4).

Higher Plane Curves: Dr. Story, 1880–81, 2 hrs., (5); 1881–82, 1st half-year, 3 hrs., (1).

Solid Analytic Geometry, (General Theory of Surfaces and Curves): Dr. Story, 1881–82, 2d half-year, 3 hrs., (1); 1882–83, 1st half-year, 3 hrs., (6).

Theory of Geometrical Congruencies: Dr. Story, 1882–83, 2d half-year, 2 hrs., (4).

Modern Synthetic Geometry: Dr. Franklin, 1877–78, 2 hrs., (2).

Theory of Invariants: Dr. Story, 1882–83, 10 lectures, (8); 1883–84, 3 hrs., (6).

Determinants: Dr. Franklin, 1880–81, 1st half-year, 2 hrs., (9); 1882–83, 20 lectures, (9).

Modern Algebra: Dr. Franklin, 1880–81, 2 half-year, 2 hrs., (6); 1881–82, 2d half-year, 2 hrs., (6).

Elliptic Functions: Dr. Story, 1878–79, 2 hrs., (2); 1879–80, (continuation of the previous year's course), 3 hrs., (4); Dr. Craig, 1881–82, 3 hrs., (8); 1883–84, 3 hrs., (4).

Elliptic and Theta Functions: Dr. Craig, 1882–83, 3 hrs., (10).

General Theory of Functions, including Riemann's Theory: Dr. Craig, 1879–80, 30 lectures, (2); 1880–81, 1st half-year, 3 hrs., (3).

Spherical Harmonics: Dr. Craig, 1878–79, 10 lectures, (6); 1879–80, 20 lectures, (6); 1881–82, 1st half-year, 2 hrs., (4).

Cylindric or Bessel's Functions: Dr. Craig, 1879–80, 10 lectures, (2).

Partial Differential Equations: Dr. Craig, 1880–81, 2d half-year, 2 hrs., (5); 1881–82, 2d half-year, 3 hrs., (9); 1882–83, 2d half-year, 2 hrs., (2).

Calculus of Variations: Dr. Craig, 1879–80, 12 lectures, (9); 1881–82, 1st half-year, 2 hrs., (8); 1882–83, 1st half-year, 2 hrs., (6).

Definite Integrals: Dr. Craig, 1876–77, 1st half-year, 3 hrs., (5); 1882–83, 1st half-year, 2 hrs., (2).

Mathematical Astronomy: Dr. Story, 1877–78, 3 hrs., (2); 1882–83, 3 hrs., (2); 1883–84, 3 hrs., (2).

Elementary Mechanics: Dr. Craig, 1876–77, 2d half-year, (8).

Statics: Dr. Franklin, 1882–83, 2d half-year, 3 hrs., (5).

Analytic Mechanics: Dr. Craig, 1877–78, 1st half-year, (6); Dr. Story, 1880–81, 2d half-year, 2 hrs., (6); Dr. Craig, 1881–82, 1st half-year, 3 hrs., (8); 1882–83, 1st half-year, 3 hrs., (4); Dr. Franklin, 1883–84, 3 hrs., (6).

Theoretical Dynamics: Dr. Craig, 1878–79, 15 lectures, (6); 1883–84, 2 hrs., (5).

Mathematical Theory of Elasticity: Dr. Story, 1876–77, 2d half-year, 2 hrs., (4); 1877–78, 2 hrs., (2); Dr. Craig, 1881–82, 3 hrs., (4).

Hydrodynamics: Dr. Craig, 1878–79, 24 lectures, (7): 1880–81, 1st half-year, 2 hrs., (6); 2d half-year, 4 hrs., (3); 1882–83, 2d half-year, 3 hrs., (5).

Mathematical Theory of Sound: Dr. Craig, 1883–84, 3 hrs., (5).

Undergraduate Courses.

Conic Sections: Dr. Story, 1876–77, 1st half-year, 5 hrs., (6); 1877–78, 4 hrs., (5); Dr. Franklin, 1878–79, 3 hrs., (5); 1879–80, 3 hrs., (5); Dr. Story, 1880–81, 3 hrs., (8); 1881–82, 1st half-year, 3 hrs., (6); 1882–83, 2d half-year, 3 hrs., (9); 1883–84, 2 hrs., (14).

Higher Plane Curves: Dr. Story, 1876–77, 2d half-year, 5 hrs., (6); 1878–79, 1st half-year, 3 hrs., (6); 1879–80, 1st half-year, 4 hrs., (5); 1880-81, 2d half-year, 3 hrs., (3); 1881–82, 2d half-year, 3 hrs., (3); 1882–83, 1st half-year, 3 hrs., (3); 1883–84, 2 hrs., (2).

Solid Analytic Geometry: Dr. Story, 1878–79, 2d half-year, 3 hrs., (7); 1879–80, 2d half-year, 4 hrs., (4); 1880–81; 2d half-year, 4 hrs., (5); Dr. Franklin, 1881–82, 1st half-year, 3 hrs., (4); 1882–83, 1st half-year, 3 hrs., (6); 1883–84, 2d half-year, 3 hrs.

Differential and Integral Calculus: Dr. Craig, 1876–77, 5 hrs., (5); Dr. Franklin, 1877–78, 3 hrs., (4); 1878–79, 3 hrs., (12); 1879–80, 3 hrs., (9); 1880–81, 3 hrs., (6); 1881–82, 3 hrs., (9); 1882–83, 1st half-year, 5 hrs., (12); 1883–84, 3 hrs., (16).

Differential Equations: Dr. Craig, 1877–78, 3 hrs, (4); Dr. Story, 1878–79, 2 hrs., (5); 1879–80, 3 hrs., (8); Dr. Franklin, 1880–81, 2d half-year, 3 hrs., (4); 1881–82, 1st half-year, 3 hrs., (5); 1882–83, 2d half-year, 3 hrs., (9); 1883–84, 2 hrs., (6).

Theory of Equations and Determinants: Dr. Story, 1876–77, 2 hrs., (7); Dr. Franklin, 1877–78, 2 hrs., (1); 1878–79, 2 hrs., (1); 1879–80, 2 hrs., (6); 1880–81, 2 hrs., (5); 1881–82, 2d half-year, 3 hrs., (8); 1882–83, 2d half-year, 3 hrs, (3); 1883–84, 1st half-year, 3 hrs., (9).

Problems: Dr. Story, 1880–81, 1 hr., (4).

Teachers' Class in the Theory of Numbers: Dr. Story, 1879–80, 10 lectures, (24).

The work of the past academic year and the programme for the new year are included in the foregoing statement. The entire record confirms the wisdom of the Trustees in calling to this university, at the beginning, in a chair devoted to a fundamental subject, a teacher so renowned and so capable of drawing around him a company of superior associates and pupils.

PHYSICS.

Although the apartments here devoted to physical studies are not as large nor as conveniently arranged as they should be, the work which has been accomplished is remarkable. The university is provided with costly apparatus, much of it especially designed for research, and with the means of making new instruments as they may be devised and required. Professor Rowland has also had a large margin of time, beyond the duties positively required of him, for the prosecution of investigation, and he has been supported by an able associate, Dr. Hastings, and by competent assistants. During the past year he has continued the study of the solar spectrum by means of the concave gratings which he devised and caused to be made during a previous year in our mechanics' shop. A few of these gratings have been given away to distinguished physicists in this and other countries, and a few have been sold. Mr. Rowland has been largely occupied with photographing the spectrum, and the results of this work are likely to be given to the public at an early day in the form of a new map of the spectrum. The photographs of the spectrum so far made, extend down to B, the original negatives being about ⅔ the scale of Angström's map from B to b, equal to Angström's from b to G, and 1½ Ang-

ström's from G to the extreme ultra violet. They show 150 lines between the H lines and give the 1474 and b_3 and b_4 widely double, and the E line indistinctly double.

In October, 1882, with the consent of the Trustees, he went to Paris, as a delegate appointed by the government to represent the United States in the International Commission of Electricians convened under the auspices of the French republic; and since his return, he has been requested by Mr. Frelinghuysen, Secretary of State, to undertake a new determination of the value of the ohm, in accordance with the plan of co-operative investigation decided on by the International Commission. The expense of this inquiry will be met by an appropriation from the national treasury, but the Johns Hopkins University has liberally favored the research and has allowed the use of the building at Clifton, as well as of other convèniences in town. Under Prof. Rowland, Mr. A. L. Kimball and others will be engaged in the details of this work.

Dr. Hastings has also been called into the temporary service of the government. An appropriation having been secured from Congress for observing the solar eclipse of May 6, 1883, on the Caroline Island, he was requested to become one of the astronomical party. Leave of absence was granted to him by the Trustees, and his place

during the rest of the session was supplied by Mr. J. Rendel Harris. The scientific results of this expedition will be published elsewhere,—but it should here be mentioned that Dr. Hastings directed his attention to the Sun's corona,—and was led to entertain new views in regard to its nature, which will be fully stated in his formal report.

The original investigations of the year have been on these subjects:

On the photography of the solar spectrum by means of the concave gratings.
On the nature of the Sun's corona.
On the determination of the B. A. unit of electrical resistance in absolute measure.
On the determination of the specific resistance of mercury.
On the variation of the specific heat of water with the temperature.
On the relative wave lengths of the lines of the spectrum by means of the concave grating.
On the effect of difference of phase in the harmonics on the timbre of the sound.
On the variation of the magnetic permeability of nickel by change of temperature.

Lectures have been given by Professor Rowland on Electricity and Magnetism, four times weekly through the year.

The work of a part of the students has been guided by Dr. Hastings. The major course has included lectures, weekly through the year, and daily work in the laboratory, especially on Wednesdays. The minor course in General Physics has included instruction daily through the year in Elementary Mechanics, Acoustics, Heat, Magnet-

ism, Electricity, and Light, and a weekly exercise in the laboratory under Dr. Hastings and Mr. H. F. Reid. Advanced students have also taken part in meetings weekly, for the reading and discussion of the current physical journals.

Chemistry.

The original laboratory for Chemistry was built in the expectation that it would be large enough for a period of five years. At the end of that time there was not room for all who wished to avail themselves of its privileges, and consequently the Trustees, on June 5, 1882, after much deliberation, decided to enlarge it. Plans were accordingly drawn and contracts made, and on the third of May, 1883, the building in its improved and extended form was completed and thrown open to public observation. It now covers an area of about fifty by one hundred feet and has three full stories and a basement. In the basement are the necessary conveniences for assaying and other furnace operations; on the first floor there are large rooms devoted mainly to qualitative and quantitative analysis; on the second, are rooms for research, for the study of the director, the library, and for lectures in General Chemistry. On the third floor are rooms for the chemical and mineralogical collections, a working and lecture-room for mineralogy and a second lecture-room for chemistry. The

entire laboratory will conveniently accommodate about ninety working students.

Advanced students have been engaged, as heretofore, in the laboratory prosecuting such daily work as seemed best adapted to their various needs. Those who had completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems, and the following investigations were completed during the year. Others are in progress.

On the conduct of moist phosphorus and air towards carbon monoxide.
White phosphorus.

Oxidation of a compound containing the sulphamine and propyl groups in the ortho position with reference to each other, showing protection of the propyl.

Oxidation of paradipropylbenzene-sulphamide, showing protection of the propyl.

On the nature of sinapic acid.

The influence of light on fermentation.

Chemical examination of minerals from the neighborhood of Jones's Falls.

The results of these investigations have either already been or will soon be published in the *American Chemical Journal*. Some have also been brought before the Johns Hopkins Scientific Association at its regular meetings.

At the beginning of the year, subjects for historical study were assigned to the Fellows and others, and a course of twenty lectures was the result. These were thoroughly worked up from the original articles in the journals, and not from

works on the history of chemistry. Full abstracts of these lectures, together with complete references to the articles consulted, are to be prepared and preserved in the chemical library. Such inquiries were much facilitated by the excellent collection of chemical journals and other works which is constantly accessible.

The lectures given were as follows:

Three by Professor Remsen on "Valence";
Two by Mr. E. H. Keiser on "The History of Ozone";
Two by Mr. D. T. Day on "The Electro-Chemical Theory";
Four by Mr. W. C. Day on "Avogadro's Hypothesis";
Three by Mr. H. N. Stokes on "The Idea of the Radical in Chemistry";
Three by Dr. J. R. Duggan on "Fermentation";
Three by Dr. R. D. Coale on "The Investigations which led to our present Conceptions of Substitution."

The regular instruction in chemistry for undergraduates has been given upon the following schedule. The laboratory work has been directed by Professor Remsen, Dr. Morse, and Dr. Coale. The lectures on general chemistry (non-metals) were given daily during the first half-year by Professor Remsen, and by Dr. Morse, during the remainder of the session. During the last half of the year Professor Remsen lectured on the chemistry of the carbon compounds. In mineralogy during the first half-year, Dr. Morse gave instruction by lectures and practical exercises three times weekly and subsequently this work was continued by Dr. G. H. Williams, whose courses are to be given,

with improved facilities, during the year now opening.

Advanced students have also taken part in meetings held twice weekly through the year for the purpose of reporting on the current journals of chemistry. All the important journals were carefully read, and the articles then fully reported on. Not only the teaching staff, but the fellows and other advanced students, worked in this direction throughout the year.

BIOLOGY.

When they determined to enlarge the Chemical Laboratory, the Trustees also decided to construct a separate building for Biology. The plans were drawn by Mr. C. L. Carson, Architect, in accordance with the wishes of the Professor of Biology and the directions of the Trustees. The building was commenced in the spring of 1882, and at the date of this report is ready to be occupied.

The size of the rooms, their light, ventilation, apparatus, and furniture, give ample facilities for the study of physiology and comparative anatomy, in accordance with the best known methods, and the scientific power of the university is much increased by this addition to its material resources. The significance of this laboratory in relation to medical education is obvious. Students expecting at a later day to take up the courses in medicine,

may here acquaint themselves, not only with the use of the microscope and the modern instruments of physiological research, but may also have ample opportunities to study the normal and healthy forms and functions of living beings, before proceeding to the study of disease and its treatment. The work of such students in their second year in the laboratory includes a thorough systematic drill in Animal Physiology, with especial reference to the human body.

Description of the new Biological Laboratory.

The building stands upon the corner of Eutaw and Little Ross streets, fronting toward the Chemical Laboratory, and occupies an area of eighty-five by fifty-three feet. It is three stories high, and has in addition a basement which is entirely above ground.

The façades are treated in an adaptation of the English renaissance style, with simple and severe details, and constructed of pressed brick, with sill and band courses, trimmings to doorways, etc., of Cheat river bluestone. Terra cotta panels and spandrels and moulded brick bands are also appropriately distributed throughout the design. The interior is fitted up in a simple and substantial manner, well adapted for the various uses to which the building is put. The large rooms are cased with hard cement to 2½ feet from the floor, and the floors laid with Seyrsel vulcanized mastic, the ceilings throughout being lined with cypress, and the wainscoting, inside trimmings, etc., being of Georgia yellow pine, all finished to display the natural grain of the wood.

The general arrangement of the interior is as follows. On the basement are large well lighted and equipped rooms for advanced work in chemical physiology and animal electricity; store rooms for chemicals and glass ware; and a furnace room containing a crematory, a boiler for preparing distilled water, and a small steam engine. The first floor contains: the general laboratory, 32 × 48 feet, for less advanced students; the main lecture room; a room for storing the reagents and material required for the daily class work; an administration room, the headquarters of the chief assistant; and a room for storing diagrams and lecture apparatus, and preparing lecture experiments. On the second floor are a museum of typical specimens such as are needed for the annual courses of instruction; a small lecture room; a library of biological books and journals; rooms

for advanced study in Botany and Comparative Anatomy; and a chamber fitted up for microphotography. The third floor is mainly given up to advanced work in Animal Physiology and Histology; but contains also the mechanic's workshop, and the director's private office.

During the past year the rooms set apart for biological work have been open eight hours daily for the prosecution of advanced study and research and for courses of practical instruction in connection with classes. Original investigations, the results of which either have been or soon will be published, have been made in the following subjects:

The direct action upon the heart of ethyl alcohol. The influence of digitaline upon the heart and blood vessels. The influence of quinine upon the blood vessels. The influence of variations in arterial pressure upon the time occupied by the systole of the heart. The minute structure of the kidney. The life-history of Penicillium. Viscous fermentation. The influence of various illuminations on the growth of yeast. The structure of Porpita. The structure of the gasteropod gill. The development of the mammary gland. The structure and properties of the cavernous tissue beneath the olfactory mucous membrane.

Papers on several of the researches carried on have been read before the Scientific Association of the University, the Maryland Medical and Chirurgical Faculty, &c.

Dr. Martin, it may be observed, has continued his researches respecting the action of the mammalian heart, and his paper upon the "Direct Influence of Temperature upon the rate of Beat of the Dog's Heart," which was presented to the Royal Society of London, has had the honor of being selected by that body as "the Croonian Lecture" for the current year.

In addition to the usual courses by Professor Martin and his associates, twenty-seven special lectures were given as follows:

Six lectures by Professor Martin on "Animal Heat and the Physiology of Fever."

Six lectures by Dr. W. K. Brooks on "Heredity."

Two lectures by Dr. W. T. Councilman on "Splenic Fever, as illustrating the relationship of bacterial organisms to the production of infectious disease."

Three lectures by Dr. W. T. Sedgwick on "The Physiology of Reflex Actions"; and one lecture on "The Physiological action of Quinine."

Two lectures by Mr. H. H. Donaldson on "The Influence of Digitaline upon the Circulatory Organs."

Two lectures by Mr. W. H. Howell on "The Influence of the Respiratory Movements upon the Circulation of the Blood."

Two lectures by Mr. H. N. Stokes on "The Physiological Relationships of Urea."

Three lectures by Professor A. H. Tuttle, of Columbus, Ohio, on "The Selection and Use of Microscope Objectives of High Aperture."

Most of the advanced work, however, was carried on individually, and not in classes; each student taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions. Students engaged in this kind of work, (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and criticise, if necessary) the experiments and results described in it. By studying and repeating the original

work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows: —

Osteology, *twice weekly, from the beginning of November until the end of March.*
Mammalian Anatomy, *twice weekly, until April.*
Animal Physiology and Histology, *four times weekly, through the year.*
General Biology, *three times weekly, until the middle of April.*
Embryology of the Chick, *four times weekly, from the middle of April until the close of the session.*
Plant Analysis, *twice weekly during April and May.*

In connection with the regular class instruction first year students practically studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring, there were given a few practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The stock of physiological apparatus belonging to the University being unusually large, and including several duplicates of all the more frequently used instruments, each student in the class of Animal Physiology had the opportunity and was required to perform for himself all the really fundamental physiological experiments, save such as required some special skill or the use of very delicate apparatus; these were demonstrated to the class. The cat was also thoroughly dissected by the second year students.

Practical Physiology is so frequently regarded as meaning nothing more than Histology and some Chemical Physiology, that it may be advisable to give examples of the additional experiments which students were required to perform, and of the phenomena demonstrated to them. Each student set up for himself the necessary apparatus, and studied the contraction of a muscle, simple and tetanic; the analysis of tetanus; the action of different stimuli on muscle; the general stimuli of nerves; the reflex actions of the frog's spinal cord; the beat of the frog's heart; the influence of pneumogastric stimulation upon the heart-beat; the absorp-

tion spectra of hæmoglobin and of its chief compounds; the phenomena of accommodation; Scheiner's experiment; Purkinje's figures; the comparative insensibility of the peripheral parts of the retina, etc.

Among the things demonstrated were the electrical currents of muscle and nerve; the action current; the duration of the period of latent excitation; the rate of transmission of a nervous impulse; the beat of the mammalian heart; arterial pressure; the action of the vaso-motor nerves; the secretion of glands upon stimulation of their nerves; the respiratory and vaso-motor centres; the function of the phrenic nerve; the phenomena observed in frogs, birds, and mammals after removal of various parts of the brain; the results of section of the semicircular canals; etc.

Ancient and Modern Languages.

Under the direction of Professor Gildersleeve, the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary the work of each year is concentrated on some leading author or some leading department of literature.

Since the Autumn of 1882 the Greek library has found a lodgment in the same building with the seminary room, and the seminary room itself has been furnished with the books bearing on the work immediately in hand. These rooms are much used by the advanced workers in Greek, and the approach to the laboratory ideal has been marked. It is now possible to bring much more material together for the illustration of the seminary exercises, and the familiarity with the standard works is greatly increased. While the grammatical and critical work of the advanced students is lightened by facility of reference to the authorities,

their appreciation of the historical and artistic side of their studies is evidently quickened by the new arrangement, and there is great promise of a keener and deeper interest in Greek life and art.

In 1882–83, the centre of work was Aristophanes. In the seminary proper, which met twice a week during the academic year, the Wasps and the Frogs were interpreted by the members in turn, and all the plays except the Lysistrata were analyzed and introductory lectures prepared by different members of the seminary. Studies were made in Aristophanic syntax and papers were read not only on syntactical topics but on the first and second Plutos, on proverbs in Aristophanes, on Aristophanes' theory of comic art, on the character of Kleon, on the proportion of chorus and dialogue in Aristophanes, on Philonides and Kallistratos. Work begun the preceding year was carried on, notably an elaborate study of the predicative participle in Attic prose, of which an abstract is given in *Circular No.* 22. In connection with the work of the seminary, Professor Gildersleeve, during the latter part of the academic year, conducted weekly readings in the Fragments of the Old Attic Comedy and delivered twelve lectures on Greek metres with especial reference to Aristophanes.

Besides the seminary course proper, Professor Gildersleeve delivered thirty-two lectures on the Hypotactic Sentence, interpreted select odes of Pindar, conducted twenty-two exercises in translating at dictation from Greek into English and English into Greek, and held a series of six conferences with undergraduate students, in which the leading principles of Greek literary art were set forth, with illustrations drawn from the courses pursued in the undergraduate department.

A course in the comparative study of Greek inflections was conducted by Dr. Bloomfield.

This was initiated by a course of seven formal lectures, whose aim it was to exhibit the precise degree of certainty which attached itself to the most important theory of Indo-European language-history, namely, the

theory of agglutination. It was shown that there are grave difficulties in its way, but that on the whole it afforded as yet the only satisfactory explanation propounded for the phenomena of our languages in historical times. The rest of the course was carried on under seminary organization; the origin and form of the verbal inflectional elements being the subject which received most attention. Throughout the year this work was supplemented by the lectures of the instructor.

Mr. Harris has conducted a class-course in New Testament Greek, twice weekly, through the year, and has given two public courses, one, of six lectures, on the Greek of the New Testament, and the other, of five lectures, on the Epistle to Diognetus.

Instruction was given during the year by Professor C. D. Morris, in:—

Plato: *Phaedo, four times weekly, first half-year.*
Aeschylus: *Prometheus;* Euripides: *Medea, four times weekly, second half-year.*

and by Dr. Spieker, in:—

Xenophon: *Cyropædia, four times weekly, first half-year.*
Homer: *Iliad,* XVI–XIX, *four times weekly, second half-year.*
Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.
Students have privately read for examination the following books:
Xenophon: *Convivium* (3); Herodotus: *Selections* (3); Demosthenes: *In Leptinem* (3); Isocrates: *Panegyricus* (2); Plutarch: *Themistocles* (2); Aristophanes: *Plutus* (2); Sophocles: *Electra* (2).

The instruction in Latin under Dr. Warren was carried on with increased facilities. In a room specially set apart for the Latin Seminary, a library of books selected to meet the wants of advanced students was placed, accessible to members of the seminary at all hours of the day. The

plan has been found to have great advantages. Students thus not only become acquainted with the special works bearing upon the particular authors which form the subject of interpretation, but they have their attention called to a great variety of works which are the necessary auxiliaries to the prosecution of classical studies in a broad way. Above all they have the opportunity to gain some familiarity with the new editions of authors and the special treatises, which are constantly appearing; and from seeing the activity of others they are inspired to do original work themselves.

During the past year Cicero was the author selected for special study, one hour weekly being devoted to the Orations and one to the Letters. A preliminary course of lectures was given by Dr. Warren on Cicero, with special reference to his oratorical and literary career. Attention was called to some recent dissertations, which attempt to show certain marked differences of style between the earlier and later orations, and the lines, which an investigation into such differences must follow, were pointed out. The general characteristics of the epistolary style were discussed, and some account given of the theories held in regard to the several collections of Cicero's Letters. Subjects for research, as yet imperfectly explored and likely to yield valuable results to the careful observer, were indicated. The orations were taken up in chronological order, more particular attention being paid to the Pro Publio Quinctio, Pro Roscio Comoedo, in Caecilium Divinatio, in Verrem Actio Prima, pro Milone, and Philippica II. The commentary of Asconius to the pro Milone was carefully examined, and a large portion of the pro Roscio Amerino was made the subject of critical interpretation. In the early part of the year a number of the more difficult letters of Cicero were closely studied. Later on the attention was chiefly turned to the letters of Cicero's correspondents, and papers were presented by different members of the seminary embodying the results of detailed investigations into the peculiarities of the letters of Sulpicius, Vatinius, Dolabella, Curius, Caelius, Plancus, and Marcellus. Other papers were read during the year dealing with the characteristics of vulgar Latin and various points connected with Ciceronian syntax. Some of the papers presented evinced extended reading and good powers of observation. It is believed that if nothing more, some

insight into good methods was gained, and the power to apply them, which must be the chief object in all seminary training.

In the latter part of the year, Dr. Warren lectured weekly to advanced and graduate sudents on Historical Latin Grammar, with special reference to the genesis of forms and to phonetic laws.

Additional courses have been conducted during the year by Dr. Warren, in: —

Cicero de Finibus, *weekly, first half-year.*
Lucretius, *three times weekly, first half-year.*
Livy, *four times weekly, first half-year.*
Plautus; Terence, *four times weekly, second half-year.*

by Professor C. D. Morris, in: —

Tacitus: *Histories, four times weekly, first half-year.*
Crowell's Selections from the Latin Poets, *four times weekly, second half-year.*

and by Dr. Spieker, in: —

Cicero: *Tusculan Disputations, three times weekly, first half-year.*
Horace, *four times weekly, second half-year.*

Classes in Latin Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Livy: *Bks.* VI, VII (1); Tacitus: *Germania, Agricola* (1); Cæsar: *Civil War* (7); Cicero: *De Natura Deorum* I (6); *De Senectute* (8); Quintilian: *Bk.* X. (1); Pliny: *Select Letters* (1); Ovid: (2); Vergil; *Georgics* (2); Horace: *Epistles* I, II, *Ars Poetica* (1): Terence: *Phormio; Hautontim.* (5); Lucretius: *Bk.* V (4).

In Sanskrit, one elementary and three advanced courses were conducted by Dr. Bloomfield, who also instructed a beginners' class in Hebrew during the second half-year.

After a course in Whitney's Grammar, the first part of Bopp's Nala was read by the elementary class, which met twice weekly. One of the advanced classes, meeting weekly, read two episodes of the Kathāsaritsāgara.

A second class, meeting twice weekly, followed a course introductory to the Vedas. In the beginning a short course of lectures was given, sketching the position of the Vedas in the history and literature of India. Throughout the rest of the year there were read hymns of the Rig-Veda characteristic of the life, the religion, and customs of the earliest Indian period. Particular attention was given to the relation of the language of the earliest Veda to that of the common or classical Sanskrit.

A course in Comparative Grammar of Sanskrit was carried on in the following manner. The subject chosen for treatment was the representation of the two Indo-European series of gutturals especially in Sanskrit but with constant reference to the nearer relatives of the Indian languages, especially the Zend, and the Greek. The more important investigations on this subject were made the basis of the discussion, but these were constantly supplemented by the lectures of the instructor.

A statement of the course in the comparative study of Greek inflections is made under Greek above.

The class in Hebrew followed a course through Davidson's grammar, and afterward the reading and analysis of the first chapters of Genesis were entered upon.

In German advanced courses were conducted as follows:

Gothic. *Weekly, first half-year, and twice weekly, second half-year.* DR. WOOD.

Old High German. *Twice weekly.* DR. BRIGHT.

Middle High German. *Twice weekly.* MR. RADDATZ.

History of German Literature, consisting of lectures in German. *On alternate Saturdays.* DR. WOOD.

Deutsche Stilübungen and Essays. *Monthly.* MR. RADDATZ.

Reading of the classical authors. *Four times weekly.* DR. BRIGHT.

Prose Composition. *Weekly.* MR. RADDATZ.

German Syntax. *Three times monthly.* MR. RADDATZ.

Other classes were instructed by Dr. Wood and Dr. Bright four times weekly.

Selections were read from Schiller's, Goethe's, and Humboldt's Prose, Dahn's *Urgeschichte der germanischen und romanischen Völker*, Hodges' *Scientific German* and Goethe's *Egmont*, and one exercise was given weekly in grammar and prose composition.

Students have read privately for examination:

Schiller's *Wallenstein* (1), *Tell* (2), *Neffe als Onkel* (15); Gryphius' *Peter Squenz* (1); Middle High German: Selections from Weinhold's Reader (1).

Dr. Wood has met two advanced classes in Anglo-Saxon and Early English, each twice weekly.

He has read with them Sweet's Anglo-Saxon Reader, part of Cynewulf's Elene, and Specimens of Early English, ed. Morris and Skeat, Pt. I. To the same classes he also lectured, once weekly, first half-year, on Comparative Anglo-Saxon Grammar. In the second half-year, a second hour weekly in Gothic (see German courses) was substituted for the weekly hour in Old-Saxon announced.

There was also a fortnightly meeting of the advanced students under the direction of Dr. Wood during the second half-year, at which papers were read, brief reports presented, and the contents of recent scientific journals discussed.

Besides these, the following less advanced classes, including the minor course classes, have been conducted by Dr. Wood.

Anglo-Saxon for beginners. *Weekly.*
Chaucer, The Prologue, etc., ed. Morris. *Twice weekly, second half-year.*
Shakspeare, Macbeth. *Weekly, first half-year.*
English Phonetics, Sweet's Hand Book. *Weekly, first half-year.*

Dr. Browne has met, twice weekly, a class for reading works by the best English Prose Writers. Selections from Burke, Fitz-James Stephen, and Defoe have been read. Essays have been written monthly by each member of the class, and have been corrected and commented upon by the instructor.

In the Romance Languages advanced courses were conducted by Mr. Elliott as follows:

Old French—The *Passion du Christ* (x century) was taken up and its mixed dialect character particularly studied in its linguistic relations to both the Provençal and Langue d'oïl types. *Twice weekly, first half-year.*

Old Franco-Norman Dialect.—The *Vie de Saint Alexis* (xi century) and Wace's *Roman de Rou* (xii century) were examined in their relation to English and to the French proper. *Twice weekly, second half-year.*

Provençal.—Extracts from Bartsch's *Chrestomathie Provençale* confined to the xii century language with practical exercises and special comparison with the Latin and the other Romance idioms, in phonetics and morphology. *Weekly, through the year.*

Romance Dialects.—Lectures and practical exercises in the Italian and Provençal dialects. *Weekly, through the year.*

Portuguese.—Os Lusiadas de Camões was read with special reference to the language of this period as compared with the Spanish and Latin. *Weekly, through the year.*

Italian.—Dante. *Twice weekly, first half-year.*

Spanish.—Don Quijote. *Twice weekly, second half-year.*

Mr. Marcou gave lessons in:—

Old French. *Twice weekly, through the year.*

French Literature. *Weekly, through the year.*

He also conducted the Minor Course classes in French, which met seven times weekly.

The reading embraced Fustel de Coulanges, *La Cité Antique;* Elisée Reclus; Moliére; Victor Hugo; etc., and there was one exercise weekly in grammar and prose composition.

M. Rabillon's exercises were these:—

Two public courses on French Literature, including twenty-two lectures (in French).

Classes in French conversation and composition and in the rudiments of French.

Professor Paul Haupt, of the University of Göttingen, having accepted a call to this university, is expected to begin his instructions at the beginning of the new academic year. His department includes the group of Shemitic Languages,—Hebrew, Arabic, Ethiopic and Assyrian.

History and Political Science.

The instruction in History and Political Science has been under the direction of Dr. H. B. Adams, with the coöperation of Dr. R. T. Ely, in Political Science, and of Dr. J. F. Jameson in Ancient History. A decided impulse was given to these studies by an important accession of books received by the university early in the academic year. The library of Professor Bluntschli, of Heidelberg, the renowned teacher and writer, having been offered for sale, was bought by a number of the German citizens of Baltimore, and formally presented to the Trustees of this institution December 20, 1882. A particular statement of the character of this most welcome gift may be found elsewhere.* These books were temporarily placed in a room on Monument street, where a company of graduate students assembled every Friday evening, during the year, for a two hour session. Their studies at this time were chiefly directed to American Institutional and American Economic History, and a number of papers, the results of this work, have already been published.

The instruction given by Dr. Adams during the year was as follows:

1. Class-lectures on the Sources of Early English History were given weekly during the first half-year, and on Comparative Constitutional History (with Bluntschli's "Lehre vom Modernen Stat" as basis),

*Johns Hopkins University Circulars, No. 21, February, 1883.

during the second half-year. These lectures were given in the small lecture-room at the Peabody Institute, where, through the courtesy of the authorities in charge, the privilege has been enjoyed of exhibiting to the class all available books and sources of information mentioned in the lectures. These literary materials were briefly described and then referred to individuals for more detailed examination at the Institute during the week, each man taking some one theme or original authority. Such study led to a course of student lectures, the second half-year, upon special topics connected with the class-work.

2. A Minor Course in Modern History, for students of at least one year's standing, five hours weekly throughout the year. The first part of this course consisted of lectures, essays, and examinations on the Italian Renaissance, with Sismondi's History of the Italian Republics for a class-book, and with a class-library consisting of Symonds, Burckhardt, Villari, Milman, Hallam, etc., for topical reading and reference. The second part of the course was devoted to a study of the Reformation in Germany, Switzerland, France, and England, together with the Revolt of the Netherlands and the Thirty Years' War, with frequent oral and written examinations.

3. An Introductory Course of twelve lectures on Oriental History.

Four public lectures were given by Dr. Adams before the Peabody Institute on Local Life and Home Institutions.

The instruction by Dr. Ely was as follows:

1. Class-lectures on Finance and Administration, three hours weekly throughout the year. Particular attention has been devoted to the General Principles of Banking, and Banking in the United States, to monometallism and bimetallism, and to taxation. Each member of the class has written a description of the National Banking System, basing his essay on the banking laws, government documents and such other material as he could command. Papers on monometallism and bimetallism were read before the class by students, and were followed by a discussion. Papers have been written by students on different topics connected with the Financial History of the United States, such as the First and Second United States Banks, the Income Tax, National Finances from 1861–5, etc. Beginnings of a series of papers on finance in state and city have been made and will be continued during the coming academic year. Apart from financial administration, attention has been given to the Civil Service in this and other countries, and to municipal government.

2. Six public lectures, since printed in a volume, upon the History of French and German Socialism.

3. A Minor Course in Political Economy, five hours weekly throughout the year. The first part of this course consisted of an exposition of the Principles of Political Economy, with the work of John Stuart Mill as a basis. The second part was a further development of this subject, together with lectures upon Historical Systems of Political Economy.

Dr. Jameson gave class instruction to undergraduates twice a week through the year, in the History of Greece and Rome, and in the History of Early Europe.

Philosophy.

The instruction in Philosophical subjects still remains in charge of three lecturers. Professor Morris, of the University of Michigan, continues to spend the first half of the year among us, and in February his place is taken by Dr. G. Stanley Hall. Mr. Peirce's courses in Logic have gone on through the year.

The instruction during 1882–83 included the following subjects:

Prof. G. S. Morris, during the first half-year:—
Philosophical Seminary: Science of Knowledge. *Twice weekly.*
History of Philosophy in Great Britain. *Three times weekly.*
Philosophy of History, (Hegel). *Weekly.*
Ethics and History of Philosophy, (minor course). *Daily.*
Lectures on Ethics, (introductory course). *Weekly.*

Dr. G. S. Hall, during the second half-year:—
Psychology, (advanced course). *Four times weekly.*
Psychology, (elementary course). *Three times weekly.*

Mr. C. S. Peirce, through the year:—
Logic. *Four times weekly.*

Physical Culture.

The necessity of providing some means for the promotion of physical culture and of active sports has constantly been considered by the authorities since the opening of the university, but it is only

within the past twelve months that a satisfactory plan has been agreed upon. At the beginning of the year Dr. E. M. Hartwell, one of our own former Fellows, a graduate first in biological and afterwards in medical science was invited to come here as an instructor in physical culture. He delivered a short course of lectures on Health to the undergraduates, last winter, but he gave his chief attention to the subject of a gymnasium and to the promotion of out door sports. Until the grounds at Clifton could be made ready for ball-playing, the temporary hiring of Newington Park was authorized by the Trustees. Finally, they determined to erect a suitable building for bodily training and gymnastic sports, quite near to the university class rooms. After Dr. Hartwell had visited several of the best gymnasiums in the country a plan was adopted, and the contracts were made for the construction of a large gymnasium, which at the date of this report is nearly ready to be occupied. It will be furnished with the Sargent apparatus, such as is used in the Hemenway gymnasium of Harvard College. Suitable rooms for the director, and for bathing and dressing will be provided near the exercise hall.

Great advantages are expected from this addition to our resources, and I cannot refrain from expressing the belief that both the gymnasium and the play-ground will contribute to the health and

pleasure of the students, and secure their development in strength and grace. I hope that the new arrangements will foster companionship in hours of recreation, and encourage agreeable exercise, out of doors in fine weather, in doors during the inclement season; that methods of securing to each individual the training best adapted to his requirements will be steadily provided; and that in all the sport which will come from these opportunities it will be the sport of gentlemen and not of hired performers.

There is danger that "professional" play will gradually cease to be "play" and become a business. It cannot then expect encouragement from the authorities,—for it will no longer contribute to the zest of college comradeship or the maintenance of good health. Men devoted to intellectual pursuits will not long take pleasure in competing with those to whom the exercise of the body is the principal business of life.

The ground plan of the building in which the gymnasium and dressing rooms are contained resembles in shape a letter L turned thus ⌐. The main building of the ⌐ abutting on Garden street is 104 feet in length, includes the gymnasium proper and a vestibule, and the wing of the ⌐ extending from Garden street to the rear of Bentley Hall is nearly 85 feet in length. The entrance to the building is on Garden street at the junction of the main building and the wing of the ⌐. The entrance is through a vestibule, out of which, upon the first floor, doors open into the main hall and into the private dressing rooms, while on the second floor, at the head of a flight of steps, is the door of the Director's rooms, in which the physical examinations are made and recorded. The vestibule and gymnasium hall are in the new building; while the dressing and bath rooms, and the offices of the Director are in the wing.

The main hall comprises a single room, open to the roof, and has a total height from floor to ridge pole of 43 feet. It has upwards of 3400 square feet of flooring; its walls, of painted brick, are 25 feet high and 18 inches thick; and each of its side walls contains seven high and wide windows whose sills are seven feet from the floor.

GRADUATES OF THE YEAR.

The number of undergraduates who have come forward to the baccalaureate degree, during the year, is ten, making the whole number of bachelors of arts, here created in five years, fifty-six. The names of those graduating in 1882–83 are as follows:

BACHELORS OF ARTS.

William S. Bayley, Baltimore.
Maurice Fels, Philadelphia.
D. Sterrett Gittings, Baltimore.
W. Beatty Harlan, Churchville.
George T. Kemp, Baltimore.
Gonzalez Lodge, Baltimore.
William E. Stratton, Baltimore.
Henry W. Williams, Baltimore.
Henry V. Wilson, Baltimore.
Wm. J. Witzenbacher, Hagerstown.

Six candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy. The whole number of persons admitted among us to this second degree is thirty-nine.

The names of the doctors of philosophy (1882–83) and the titles of their theses are as follows:

DOCTORS OF PHILOSOPHY.

William J. Alexander, of Hamilton, Ontario, A. B., University of London, 1876. His principal subject was Greek, the subsidiary, Latin. He submitted a thesis on "Participial Periphrases in Attic Prose," which has been published in the American Journal of Philology.

William C. Day, of Baltimore, A. B., Johns Hopkins University, 1880. His principal subject was Chemistry, the subordinate, Physics. He submitted a thesis on "The Oxidation of β-Cymenesulphamide," which has appeared, in modified form, in the American Chemical Journal.

William P. Durfee, of Berkeley, California, A. B., University of Michigan, 1876. His principal subject was Mathematics, his subordinate, Physics. He submitted a thesis on "Symmetric Functions," of which portions have already appeared in the American Journal of Mathematics.

George S. Ely, of Fredonia, N. Y., A. B., Amherst College, 1878. His principal subject was Mathematics, his subordinate, Physics. He submitted a thesis on "Bernouilli's Numbers," of which portions have already appeared in the American Journal of Mathematics.

Kakichi Mitsukuri, of Tokio, Japan, Ph. B., Yale College, 1879, who here pursued studies in Biology, and has since been called to the Professorship of Zoölogy in the University of Tokio, Japan. His thesis on "The Structure and Significance of some Aberrant Forms of Lamellibranchiate Gills," has been published in the Monthly Journal of Microscopical Science.

Bernard F. O'Connor, of Baltimore, Bach. ès Lettres, Université de France, 1874. His principal study was the Romance Languages, the subordinate, Latin. His thesis on "The Syntax of Ville-Hardouin" was submitted to Professor J. A. Harrison, of Washington and Lee University.

Recent Discussion of Collegiate Instruction.

During the past year, it has been thought desirable to consider in a careful way the subject of college education by itself and in its relations to university work. A Board of collegiate instructors was accordingly organized in June, 1882, consisting of nine members, the President of the University, three professors and five associates. Between that date and April 7, 1883, they held a series of twenty meetings, in which they made a careful examination of the methods pursued in kindred institutions, the American college and scientific school, the English collegiate system, the German gymnasium and realschule, and other foundations for the training of young men.

In constituting this board, one representative was taken from each of eight departments of

study, (four called "literary," and four called "scientific,") namely, Greek, Latin, Modern Languages, and History: Mathematics, Chemistry, Physics, and Biology. It happened also that among this number were graduates of a great variety of institutions,—University of Oxford, University of Cambridge, University of London, University of Heidelberg, University of Leipsic, University of Göttingen, University of Strassburg, Harvard College, Yale College, Amherst College, Haverford College, Sheffield Scientific School, College of Physicians and Surgeons (N. Y).

Looking therefore at the present pursuits of the members of the Board, and at their previous training, it is obvious that they are familiar in their personal experience with widely different methods of education and with various requirements of intellectual life. It would be presumptuous to suppose that their decisions are final. Doubtless year by year improvements will be made in the plans upon which they have agreed. Doubtless, with all the study now given to higher education and to the science of pedagogics, the colleges of the future will be better than the colleges of the past. Nevertheless, the unanimous conclusions of such a body of men, approved subsequently by two other supervisory bodies in the University, may be regarded as marking a positive station in the advancement of our educational plans. The diffi-

culties encountered in this discussion will never be entirely overcome. They involve the old question of reconciling freedom and obligation, or, in other words, of liberty and law. It is clear that some choice must be allowed to every student, and indeed required of him. No one, however good his talents, can pursue advantageously all the inviting subjects which are presented to his intellectual appetite. He must select. On the other hand, if a youth of collegiate age is left to choose without guidance, the infirmities of human nature are such that he is likely to blunder, or to choose the easy work instead of that which will be the most fruitful, or oftener still, to take a little of this and a little of that in inadequate quantities which may satiate the appetite, while they yield no suitable nutrition. The Board at length agreed to arrange seven courses of study, each of which is believed to be good for a certain class of minds; each of which contains indispensable studies; each of which combines mathematics and physical science, with literature, philosophy, and history.

In determining what course to follow, the student is to have, hereafter as heretofore, the counsel of a member of the Board, as his Adviser, and he is not to change from one course to another, without very special reasons approved by the entire Board. All the courses lead to the same degree,

that of Bachelor of Arts, which can usually be gained three years after the matriculation is completed. The matriculation is believed to be as difficult to pass, as the examinations usually required for admission to a Sophomore class. Good students are allowed to remain with us one year, before completing matriculation, and thus the time devoted to the college courses corresponds with that which is usual in American colleges. Some go on more rapidly; some more slowly. It is our desire to receive scholars about the age of sixteen, and to graduate them about twenty years of age; so that one, two, or three years of non-professional university studies may be pursued among us, or elsewhere, by the recent graduates, looking forward in many cases to the second degree of Master of Arts and Doctor of Philosophy. An extended statement of the conclusions of the Board, here briefly stated, may be found in the Annual Register for 1882-83, published in June last, to which is appended a special paper "on the opportunities here afforded for collegiate training." While the discussion was in progress much encouragement was received from one of the most cultivated members of the bar in Baltimore, Hon. S. T. Wallis, who delivered a public address on Collegiate Education in its local aspects,—since printed, (as elsewhere stated), and widely read.

Chesapeake Zoölogical Laboratory.

I shall say but little of the Chesapeake Zoölogical Laboratory in this place (although its work has been of great value), because the Director, Dr. Brooks, has prepared at my request, a careful review of all that has been done by this branch of the university since it was established in 1878. His careful report is given on a subsequent page. The laboratory has been stationed in three seasons on the Chesapeake, in three seasons at Beaufort, N. C. Forty well trained investigators have been connected with it, and their researches have contributed more or less toward the publication of fifty-five papers, of which a printed list is given. Dr. Brooks' study of the oyster question deserves the special recognition of all the citizens of Maryland who are interested in this important subject. For the scientific work which he did in this connection he received a medal from the *Société d'acclimatation*, of Paris, in 1882. Within the past year, one of his co-workers, Mr. H. W. Conn, has been honored with a Walker prize given by the Boston Society of Natural History for his paper on *Thallassima*.

Library.

Our library has now reached a considerable size, but its value depends not so much upon the number of volumes, as upon their character.

Some books were bought, at the beginning, on general principles, as of importance to all members of the university. This selection included various indispensable dictionaries and encyclopædic works, several series of periodicals, and a selection of important texts, grammars, histories, and books of acknowledged literary value. This nucleus was soon surrounded by special collections brought together under the general superintendence of the library at the request of the principal teachers. The result has been a choice collection of modern books, if not large, yet well adapted to our needs and constantly augmented. As the space originally appropriated is now filled, it has been found convenient to detach certain portions of the library for use in other rooms,—a plan which has disadvantages as well as merits. On the one hand, it is convenient to the instructor to have within easy reach of his class-room a collection of books; on the other hand, the library, as a whole, sometimes seems to lose by this arrangement a part of its attractions. At present, as far as I can judge, the tendency to remove books from the central room has gone quite far enough, and we should all look forward to the time when more ample space will be appropriated for the general library, and when more ample funds will be allowed for the purchase of duplicate copies of such books as may be

specially needed both in the central room and in the several laboratories and seminaries. Another solution of the difficulty will be for us to turn more and more to the Peabody Institute, the general library designed by its founder for the use of scholars in Baltimore, and to maintain in the university only the special apparatus which the various departments require.

It may be worth while to recall in this connection the words of a well-known writer on the value of libraries in university education. Carlyle, in a passage of his "Heroes and Hero Worship," says:

> . . . "the University which would completely take in that great new fact, of the existence of Printed Books, and stand on a clear footing for the Nineteenth Century as the Paris one did for the Thirteenth, has not yet come into existence. If we think of it, all that a University, or final highest School can do for us, is still but what the first School began doing,—teach us to read. We learn to read, in various languages, in various sciences; we learn the alphabet and letters of all manner of Books. But the place where we are to get knowledge, even theoretic knowledge, is the Books themselves! It depends on what we read, after all manners of Professors have done their best for us. The true University of these days is a Collection of Books."

Within the year, besides many smaller gifts, the University has received as a present from some of the German residents of Baltimore, the library of Dr. Bluntschli, long honored as a Professor of Public Law in the university of Heidelberg. The collection is very valuable from many points of view; first as a token of good will from some of our friends and neighbors who took this mode of showing their appreciation of our work; next as

a memorial of an illustrious man, whose writings have tended to establish the true idea of a modern state, and of a successful teacher, two of whose followers are enrolled on our staff. But besides this, the collection of books is quite comprehensive, being particularly rich in treatises on political science now difficult to find. The reception of this library was made the occasion for a social assembly in which the donors and the members of the university took part. A full account of the library and of the presentation may be found in the Johns Hopkins University Circulars for February, 1883.

The Librarian's acknowledgment of other gifts will be found in the appendix. The number of bound volumes belonging to the University, September 1, 1883, was 18,700; the number of periodicals received was 382. Besides the serials to which the University subscribes, a large number are taken in the Library of the Peabody Institute and in other libraries of the city.

By the courtesy of librarians at a distance we continue to be favored occasionally with the loan of books not accessible to us in Baltimore. Thanks are especially due to the Librarian of the Surgeon General's Office, U. S. A., and to Yale College.

The arrangement for calling attention to recent publications, which is known among us as the New Book Department, is of the highest value.

Collection of Minerals.

The University continues to be indebted to George T. Marye, Esq., of San Francisco, for his kindness in sending to us, from time to time, valuable specimens of the mineral resources of the Pacific States. By the liberality of Messrs. Wells, Fargo & Co., of San Francisco, and of the Adams Express Company, through their Baltimore agency, these gifts are transported across the continent without any charge to us. Some purchases of other minerals have been made, and some other gifts have been received. The mineral collection is now in the hands of Dr. G. H. Williams, and under his care will be constantly in use for the instruction of those who study mineralogy.*

University Societies.

A considerable part of the activity of the University is manifested in the several associations, composed of members of the faculty and advanced students, which meet regularly for the presentation and discussion of original papers. These societies are:—

1. The Scientific Association, under the presidency of Professor Sylvester, which has held seven meetings. Papers have been read by:—

*Since the date of this report, the Johns Hopkins University has bought at the suggestion of Professor G. J. Brush, the distinguished mineralogist, a very valuable collection brought together by the long continued exertions of Professor O. D. Allen, of the Sheffield Scientific School.

G. Bissing, note on the Helmholtz-Koenig controversy.
W. K. Brooks, on alternation of generations in the Hydro-Medusae.
H. W. Conn, radial and bi-lateral symmetry in animals.
W. T. Councilman, on the lower organisms in their relation to disease.
J. R. Duggan, on pleomorphism in Penicilium.
E. M. Hartwell, note on the anatomy of the malar bone; on the relation of bi-lateral symmetry to function.
C. S. Hastings, on a newly-recognized agent in geological change; on the transit of Venus.
A. L. Kimball, preliminary notice of a new determination of the value of the Ohm.
I. Remsen, on white phosphorus; on the action of phosphorus on moist air; on some recent investigations upon what is called the "nascent" state of elements.
H. A. Rowland, on progress in spectrum photography; note on the distribution of heat in the spectrum of an incandescent solid body.
W. T. Sedgwick, notes from the biological laboratory.
J. J. Sylvester, on the graphical proof of certain algebraical problems.
A. H. Tuttle, on cilia in the human kidney.
G. H. Williams, review of the results obtained by Fouqué and Michel Lévy, of Paris, in the synthesis of rocks.

2. The Philological Association, under the presidency of Professor Gildersleeve, which has had seven meetings. Papers have been read by:—

W. J. Alexander, on Matthew Arnold's poetry test; participial periphrases in Attic prose.
M. Bloomfield, on a search for functional and dialectic differences in the present systems of the Veda; Arthur C. Burnell and the Talavakāra Brāhmana; the general theory of Greek accentuation; the etymology of *φίλος*.
J. W. Bright, on a fragment of the Cura Pastoralis.
A. M. Elliott, on functional differences of the past participle in the periphrastic perfects of the Latin, old and modern French.
A. Emerson, on the so-called dying Alexander of the Uffizi Gallery.
B. L. Gildersleeve, on aesthetic and grammar; on the symmetrical structure of the Pindaric odes.
J. R. Harris, on the locality of the treatise of Palladius *De Agricultura*; "New Testament autographs"; the normal forms of the Pliny and Cicero letters; notes on the stichometry of Euthalius.

H. C. G. v. Jagemann, on the second mutation of consonants in French; some points in the relations of the Norman dialects to English pronunciation.

P. B. Marcou, on French syntax as affected by the cultivation of style.

C. D. Morris, on a probable error in Plutarch; a note on the Chalkidians; on the Athenian jurisdiction over the allies.

B. F. O'Connor, review of Professor Harrison's "French Syntax."

E. H. Spieker, on the use of ὅτι (or ὡς) in direct quotations.

A. H. Tolman, on quantity in English verse and the use of the hexameter; the laws of tone-color in the English language.

M. Warren, on the importance of Latin glossaries with special reference to Codex Sangallensis, 912, Saec. VII–VIII; on a Plautine pun.

3. The Mathematical Society, under the presidency of Professor Sylvester, which has had seven meetings. Papers have been read by:—

E. Barnes, note on the strophoids.

E. W. Davis, on the maximum value of a certain determinant; note on binodal quartics.

W. P. Durfee, on the tabulation of symmetric functions.

G. S. Ely, on a geometric locus; on the numbers $a_{m,s}$ which occur in connection with the proof of Staudt's theorem concerning Bernouilli's numbers; on the divisions of Euler's numbers.

F. Franklin, on Crocchi's theorem; on the expression for the volume of a tetrahedron in terms of its edges; on partitions; on the value of Euler's constant.

A. S. Hathaway, on the equation of a curve referred to a maximum inscribed triangle; a proof of a theorem of Jacobi, by correspondence.

O. H. Mitchell, note on conic sections.

C. S. Peirce, on a class of multiple algebras.

W. E. Story, on measurement in non-Euclidean geometry; on the non-Euclidean theory of conics; a remark on Farey series; on the number of intersections of curves drawn on quadrics; on the number of intersections of curves drawn on a given ruled surface.

J. J. Sylvester, on certain successions of integers that cannot be indefinitely continued; on Crocchi's theorem; on a fundamental theorem in the new method of partitions; proof of a well-known development of a continued product in a series; on the number of fractions in their lowest terms whose numerators and denominators are limited not to exceed a certain number; on a general theorem in partitions; on a theorem in the *Fundamenta Nova;* on Farey series.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, which has held frequent meetings. Among the papers read were the following: —

H. B. Adams, the English parish in America; Plymouth Rock restored.
W. Allan, the Peninsula campaign of 1862.
C. M. Armstrong, taxation in Maryland.
E. W. Bemis, local government in the Northwest.
H. W. Caldwell, the income tax in the United States.
W. T. Croasdale, town and gown.
A. B. Davis, local government in Montgomery county.
R. T. Ely, money and its functions; political economy in Germany in 1882; the past and present of political economy.
F. J. Goodnow, the office of public prosecutor.
J. F. Jameson, account of the contents of the Bluntschli library.
J. Johnson, customs of land tenure among the boys of the McDonogh Institute; old Maryland manors.
J. H. B. Latrobe, recollections of Madison and other statesmen.
B. J. Ramage, the Baltimore & Ohio employés relief association; the district system of South Carolina; from a Connecticut town to a South Carolina parish.
J. C. Rose, municipal politics in Baltimore.
C. H. Shinn, the migration problem; the Spanish plots in the Southwest; the university of Oxford and the Oxford humanists.
L. W. Wilhelm, the national banking system of the United States; the township in Maryland.
T. Williams, the revised tariff in its relation to the economic history of the United States.
A. Yager, an essay on the financial history of the United States during the civil war.

5. The Metaphysical Club, under the guidance of Messrs. G. Stanley Hall, G. S. Morris and C. S. Peirce, which has held seven meetings. Communications were presented as follows: —

J. M. Cattell, on the recent philosophical journals.
J. Dewey, knowledge and the relativity of feeling; Hegel and the theory of categories.

B. L. Gildersleeve, rhythm in the classic languages.
G. S. Hall, a study of reaction, time, and attention in the hypnotic state.
J. Jastrow, the logical problem; a note on mechanical logic.
H. N. Martin, on the development of sight in the lower organisms.
C. T. McDaniel, on Samuel Tyler, a member of the Baltimore Bar, who wrote on philosophical subjects.
G. S. Morris, university and philosophy; on the philosophical work of Henry James, Sr.
I. Remsen, on Wundt's Logic of Chemistry.
W. T. Sedgwick, concerning perception and reflex action in the frog.
A. H. Tolman, a review of Dr. Hopkins's "Outline Study of Man."

6. The Naturalists' Field Club, under the presidency of Dr. Sedgwick.

This was organized by members of the university, but includes in its list of members other residents of Baltimore, interested in Natural History. The club works in three sections—Geology and Mineralogy, Zoology, and Botany. Each section selects its own officers and arranges for its own field excursions and its own meetings. There are also monthly meetings of the whole club, at which the chairmen of the different sections report progress, and an address on some topic of Natural History is given by one of the members. During the last winter special public addresses were given by Professor H. N. Martin, on The Life and Work of Charles Darwin; by Mr. P. R. Uhler, on The Geology of the Surface Features of the Baltimore Area; by Dr. B. W. Barton, on The Dispersion of Seeds and the Migration of Plants; by Mr. H. H. Donaldson, on A Trip to Labrador and Newfoundland; by Dr. W. T. Sedgwick, on The Migration of Birds.

Public Lectures.

During the year the following courses of lectures, open to the public, were given in Hopkins Hall:—

1. On the Greek of the New Testament and the Early Fathers, by Mr. J. Rendel Harris, six lectures, with an average attendance of 73.

2. On the Eddas and other Old Norse Literature, by Dr. William H. Carpenter, Fellow by Courtesy, twelve lectures, with an average attendance of 122.

3. On the Epistle to Diognetus, by Mr. J. Rendel Harris, five lectures, with an average attendance of 58.

4. On French and German Socialism, by Dr. R. T. Ely, six lectures, with an average attendance of 117.

5. On Etchers and Etching, by F. Seymour Haden, F. R. C. S., England, three lectures, with an average attendance of 222.

6. On Michel Angelo, by W. W. Story, Esq., of Rome, one lecture, with an attendance of 260.

7. On Philosophy and Christianity, by Professor George S. Morris, eight lectures, with an average attendance of 137.

8. On Poetry, as an Embodiment of the Spiritual and an Interpretation of Life, by Professor Hiram Corson, of Cornell University, ten lectures, with an average attendance of 202.

9. On Anglo-Saxon Poetry, by Professor James A. Harrison, of Washington and Lee University, ten lectures, with an average attendance of 100.

10. On the Principles and Methods of Intellectual Training, by Dr. G. Stanley Hall, eight lectures, with an average attendance of 191.

11. On the Relations of Literature to Modern Society, by Mr. George W. Cable, of New Orleans, six lectures and one reading, with an average attendance of 225.

12. On the Early French Chroniclers of the Crusades, by Dr. Bernard F. O'Connor, Fellow by Courtesy, six lectures, with an average attendance of 63.

13. On French Literature, by M. Rabillon, two courses (in the French language), including twenty-two lectures, with an average attendance of 37.

These thirteen courses included one hundred and four lectures. The average attendance upon the lectures (not including those given in the French language) was one hundred and forty-eight.

PUBLICATIONS.

Three numbers of the fifth and the first number of the sixth volume of the 'American Journal of Mathematics have been issued during the academic year. A Memoir on the Abelian and Theta Functions, by Professor Cayley, containing the substance of his lectures given before this university in the previous year, has appeared in the Journal. Papers by members of the University have been contributed as follows: —

Some elliptic function formulæ, by T. Craig.
Note on the counter-pedal surface of an ellipsoid, by T. Craig.
On a theta-function formula, by T. Craig.
On quadruple theta-functions, by T. Craig.
An expression of the co-ordinates of a point on a bi-nodal quartic curve as rational functions of the elliptic functions of a variable parameter, by E. W. Davis.
Tables of the symmetric functions of the twelfthic, by W. P. Durfee.
The tabulation of symmetric functions, by W. P. Durfee.
Bibliography of Bernouilli's numbers, by G. S. Ely.
Some notes on the numbers of Bernouilli and Euler, by G. S. Ely.
On cubic curves, by F. Franklin.
On the non-Euclidean geometry, by W. E. Story.
On non-Euclidean properties of conics, by W. E. Story.
On subinvariants, *i. e.* semi-invariants to binary quantics of an unlimited order, by J. J. Sylvester.
Tables of generating functions, reduced and representative for certain ternary systems of binary forms, by J. J. Sylvester.
A constructive theory of partitions, arranged in three acts, an interact in two parts, and an exodion, by J. J. Sylvester.

Six numbers of the American Chemical Journal have appeared within the year, bringing the series down to the third number of the fifth volume. They have contained papers by members of the University as follows: —

On ethoxy-metatoluic acid, by P. H. Broun.
Estimation of sulphur in organic compounds, by E. H. Keiser.
On the oxidation of benzene derivatives with potassium ferricyanide, by W. A. Noyes.
Experiments with derivatives of naphthalene, by I. Remsen and W. J. Comstock.
Oxidation of β-cymenesulphamide, by I. Remsen and W. C. Day.
Oxidation of para-dipropyl-benzene-sulphamide, by I. Remsen and E. H. Keiser.
On the conduct of moist phosphorus and air towards carbon monoxide, by I. Remsen and E. H. Keiser.
On white phosphorus, by I. Remsen and E. H. Keiser.

The third volume of the American Journal of Philology has been completed during the year, and

two numbers of the fourth volume have also been issued. A supplementary number of this Journal, containing a paper (with four plates) by Mr. Harris, on New Testament Autographs, has been published. Papers by members of the University have appeared as follows: —

Historical and critical remarks introductory to a comparative study of Greek syntax, by M. Bloomfield.
The dying Alexander of the Uffizi gallery, etc., by A. Emerson.
Studies in Pindaric syntax, by B. L. Gildersleeve.
On New Testament autographs, by J. Rendel Harris.
On stichometry. I, by J. Rendel Harris.
On the locality to which the treatise of Palladius *De Agricultura* must be assigned, by J. Rendel Harris.
On a probable error in Plutarch, Per. C. 23, by C. D. Morris.
On Bentley's English MSS. of Terence, by M. Warren.

Part IV completing the second volume of Studies from the Biological Laboratory was issued in July. Its contents are exclusively by workers among us, viz:

Notes on the development of Panopæus Sayi, by E. A. Birge.
The structure and growth of the shell of the oyster, by Henry L. Osborn.
The nervous system of Porpita, by H. W. Conn and H. G. Beyer.
On the presence of ciliated epithelium in the human kidney, by A. H. Tuttle.
The action of ethyl alcohol upon the dog's heart, by H. Newell Martin and Lewis T. Stevens.
On the effect of variations of arterial pressure on the duration of the systole and diastole of the heart-beat, by W. H. Howell and J. S. Ely.
Notes on the Medusae of Beaufort, N. C., part II, by W. K. Brooks.
The direct influence of gradual variations of temperature upon the rate of beat of the dog's heart, by H. Newell Martin.

A series of monographs, edited by Dr. H. B. Adams, entitled "Studies in Historical and Political Science," was commenced within the year.

The papers below named, constituting one volume, have already been printed with an extended index.

An introduction to American institutional history, by E. A. Freeman.
The Germanic origin of New England towns, by H. B. Adams.
Local government in Illinois, by Albert Shaw.
Local government in Pennsylvania, by E. R. L. Gould.
Saxon tithingmen in America, by H. B. Adams.
Local government in Michigan and the Northwest, by E. W. Bemis.
Parish institutions of Maryland, by Edward Ingle.
Old Maryland manors, by John Johnson.
Norman constables in America, by H. B. Adams.
Village communities of Cape Anne and Salem, by H. B. Adams.
The genesis of a New England State (Connecticut), by A. Johnston.
Local government and free schools in South Carolina, by B. J. Ramage.

A volume of Contributions to Logic by members of a class, which followed the instructions of Mr. C. S. Peirce, has been issued under his editorial care by the firm of Little, Brown & Co. It contains: —

The logic of the Epicureans, by Allan Marquand.
A machine for producing syllogistic variations, by Allan Marquand.
On the algebra of logic, by Christine Ladd.
On a new algebra of logic, by O. H. Mitchell.
Operations in relative number with applications to the theory of probabilities, by B. I. Gilman.
A theory of probable inference, by C. S. Peirce.
A note on an eight-term logical machine.

Seven numbers of the University Circulars, containing 162 quarto pages, have also been issued during the year. The Circulars are published at convenient intervals during the academic year for the purpose of communicating intelligence to the various members of the University in respect to work which is here in progress, as well as for the

purpose of promulgating official announcements from the governing and teaching bodies. Although these Circulars are designed for the members of the University, they have frequently been called for by institutions and libraries at a distance, and also by individuals who are interested in the literary and scientific activity of this University. Subscriptions and exchanges are therefore received.

HONORARY HOPKINS SCHOLARSHIPS.

In addition to the ordinary scholarships already established, eighteen honorary Hopkins scholarships have been instituted for the encouragement of conspicuous merit among undergraduate students who regularly matriculate. Six of these scholarships will be annually offered to such candidates "from the States of Maryland, Virginia, and North Carolina, as may be most deserving of choice, because of their character and intellectual promise." Two of these six scholarships are open to candidates from each of the States above named.

The value of each scholarship is $250 per annum and free tuition; and in case the holder of a scholarship withdraws from the University, for any reason, during the course of a session, such part of the allowance will be paid as seems equitable to the executive committee.

RECENT CHANGES IN THE ACADEMIC STAFF.

The additions to the academic staff since the date of the last report, are as follows:

As stated above, Dr. Paul Haupt, Professor extraordinarius of Assyriology in the University of Göttingen, has accepted a call to this university as professor of the Shemitic languages. His distinguished fitness for this post is recognized abroad and at home.

In June last, Dr. J. S. Billings, Surgeon U. S. A., was appointed Professor of Hygiene in the Medical Faculty, but his relations to the Surgeon General's office precluded his acceptance. He has, however, consented, while continuing to act as a medical adviser to the Trustees of the Johns Hopkins Hospital, to be a University lecturer on Hygiene and questions of public sanitary science.

Simultaneously with the appointment of Dr. Billings the Trustees, foreseeing the commencement of instruction in the medical sciences, designated Dr. Remsen and Dr. Martin to be respectively professors of Chemistry and Physiology in the faculty of medicine. The nucleus of an organization is thus secured, consisting of the President of the University, two scientific professors and a lecturer; and it is expected that a professor of Pathology will be next appointed.

By an act of the Trustees, in 1883, the rank of Associate Professor was formally instituted, and the persons below named, all of whom had previously been Associates, were promoted to it, viz: Messrs. H. B. Adams, M. Bloomfield, W. K. Brooks, T. Craig, C. S. Hastings, H. N. Morse, W. E. Story, and M. Warren.

Professor Hiram Corson, LL. D., of Cornell University, has been appointed Lecturer on English Literature. His course for the year 1882–3 was on Poetry; that for 1883–4 is on the Literature of the Restoration Period in England.

Professor W. Trelease, of the University of Wisconsin, has been appointed Lecturer on Botany for the current year.

Dr. W. T. Sedgwick, having been called to the Massachusetts Institute of Technology, resigned his position here as an Associate in Biology. The assistants in that department for the current year are Messrs. H. H. Donaldson, H. W. Conn, and Otto Lugger.

George H. Williams, Ph. D. of Heidelberg, recently a pupil of Rosenbusch, has become an Associate in Mineralogy, and is giving instruction in that subject, especially in the most recent methods of petrographic investigation.

E. M. Hartwell, Ph. D. and M. D., has been appointed Instructor in Physical Culture, with especial reference to the exercises which are to be promoted in the new gymnasium.

Arrangements have been made with Mr. Hugh Newell by which he will hereafter give a much larger amount of time to the instruction in Drawing. Classes in freehand and in instrumental drawing will meet five times a week from one o'clock until dark.

Mr. H. A. Todd, a graduate of Princeton, and for several years a student of the Romance Languages in Europe, has been added to the staff as an instructor in French.

G. T. Dippold, Ph. D., late of the Boston University, is the instructor of the major and minor classes in German, for the current year.

Co-operation with other Institutions. Relations to the Public.

The Johns Hopkins University continues to be desirous of co-operating with other agencies for the advancement and diffusion of knowledge, and as it grows, its relations are more and more extended. By means of its publications, it maintains a system of correspondence and exchanges with universities and learned societies throughout the world. Its participation in the electrical congress at Paris, and in the U. S. astronomical expedition to the Caroline island, have already been mentioned. For several years the Chesapeake Zoological laboratory has been co-operating with the Fish Commission of the State of Maryland to determine, if

possible, the conditions essential to the perpetuation of the oyster growth in the Chesapeake. At the request of Professor Baird, secretary of the Smithsonian Institution, and chief of the U. S. Fish Commission, a subscription was made for a table in the new marine laboratory to be established at Wood's Holl. Several members of the university made a private subscription for the maintenance of a student at Dohrn's laboratory, Naples, though their purposes were not carried out on account of arrangements made elsewhere for the same end. In association with a few other American institutions, a moderate sum is annually paid toward the maintenance of a School of Classical Studies at Athens, under the auspices of a committee appointed by the Archæological Institute of America. The recently published volume of the Archives of Maryland, issued by the Maryland Historical Society in accordance with an Act of the Legislature, was prepared for the press under the editorial care of our librarian, Dr. Wm. Hand Browne.

With the consent of the authorities of the university, but at the expense of several ladies who are engaged in teaching, a course of lectures on physics was given last winter by Dr. Hastings, to a company of young ladies who were studying this subject at school and were desirous of seeing the requisite demonstrations of physical phenomena. The suc-

cess of these lectures was such as to make it certain that some such courses of instruction should be annually provided. A course of historical lectures was given by Dr. Adams, by invitation of the Peabody Institute, in the month of February, as in previous years courses were given by Prof. Remsen and Dr. Hastings. Prof. Martin is to lecture, in the winter of 1883–4. As in many former years, frequent lectures have been given by members of the university staff, at the request of local committees in different parts of Baltimore—and the hall of the university has been repeatedly used for the promotion of educational and philanthropic movements in which all the community are interested.

Interest in the lectures given in Hopkins Hall appears to be undiminished, and it is more and more obvious that a larger room is needed for these and all our general gatherings.

Partly to interest the community in the university, and partly to bring together the workers of all departments, who are somewhat inclined to remain hidden in their special places of study and research, frequent social reunions have been held. The annual celebration occurred on February 22, 1883. Hopkins Hall was filled in the afternoon, by the members of the University and their friends, assembled to hear an address from Hon. S. Teackle Wallis, LL. D., of the Bar of Baltimore,

who took for his theme the relations of the University to the City. His discourse was received with great favor and was afterwards widely distributed, in our circulars and in a pamphlet form, among the citizens of Baltimore, many of whom, undoubtedly, first became acquainted with the aims and methods of this foundation through the clear exposition of this able speaker. In the evening of the same day there was an assembly of ladies and gentlemen in the public rooms of the University. The usual social receptions were likewise given at the beginning and end of the term, and in the course of the year there were two special gatherings,—one, when the enlarged chemical laboratory was thrown open to the public, after an address from Professor Remsen; the other, when the Bluntschli library was presented by some of the German citizens of Baltimore, and speeches were made by Col. Raine, on the part of the donors, Judge Dobbin on the part of the Trustees, and Dr. Adams on the part of students in History.

On the occasion last mentioned, the cast of an original likeness in bas-relief of Chief Justice Marshall was presented to the University by Major Innes Randolph. The present Chief Justice, Hon. M. R. Waite, LL. D., accepted an invitation to be present on this occasion, and made a brief address commemorative of the character of his predecessor in office.

It is pleasant to record the increasing evidences of the friendly encouragement of the citizens of Baltimore. Not only from individuals but from organized associations and institutions frequent tokens of co-operation and good will have been received.

Conclusion.

It is a great satisfaction to look back for seven years without recalling one instance of disorder among the students, or a single breach in the official harmony prevailing between the trustees and the academic staff, and between the workers in different branches of study. This has been secured by obedience to unwritten law, — by a willing conformity to the ideas with which the trustees in their earliest proceedings inspired the organization. It was required of them to found and maintain a University. In the exercise of this trust, constant reference was made to the present condition of learning, to the experience of kindred institutions, to the aspirations of far-sighted men, and to the immediate needs of this country, and of the State of Maryland. In adjusting conflicting interests, and in determining what course to pursue, when so many inviting paths were open, mutual concessions were requisite. No individual can claim that his views were decisive. In the adoption of important measures

there has been prolonged discussion, and an earnest endeavor to ascertain what would best promote the noble purpose of this foundation.

In looking forward to the immediate future, it appears that the time has nearly come to reduce to writing, the laws and customs which are now observed. Nearly three times as many students and twice as many resident teachers are now enrolled upon our calendar as there were in the first year. With these increasing numbers and with the enlargement of our buildings, good administration becomes constantly more difficult; good legislation more called for. We are actually working out a system of government, based indeed upon experience elsewhere, — but adapted to our own needs. Before long, it will be advisable to state our ways and usages, and define the rights and duties of the various authorities whose harmonious action is essential to the working of this intricate organism. But we must take care that we do not thus dull the enthusiasm, check the growth, or destroy the life which has been so vigorous during this first septennial period.

Experience has shown that we were wise at the outset in including a college department in the university organization. We have steadily endeavored to work out a plan of study adapted to the youth who come to us from the Baltimore City College on the one hand, and from the private

schools on the other. The result has been that we have enrolled as matriculated students a company of excellent scholars, whose steady intellectual growth it is a delight to watch. I have already stated that the discussions of the last year resulted in arrangements for the improvement of the college course;—and I look forward to the day when instead of a few scores of young men from Baltimore, we shall have hundreds availing themselves of the great advantages which have been brought to their very doors.

I can never rid myself of the belief that the essential value of the university does not depend upon the discoveries it makes, or the knowledge it accumulates and imparts, but in the characters which it develops. In the hunt for truth, we are not first hunters, and then men; we are first and always men, then hunters. While it is easy to think of brilliant examples of self-taught writers and discoverers, universities and colleges are the ordinary training places for the leaders of human thought. Therefore nothing which is degrading should be tolerated within their walls; all that is ennobling should be encouraged. Healthy, graceful, and temperate bodies, always under command; manners which spontaneously show the consideration due to superiors, inferiors, and equals; quick, accurate, discriminating, and retentive minds; skilful modes of

expression, with the pen, the tongue, and the pencil; stores of knowledge, and the power of greater acquisition; correct habits of thought and action, and an abiding love of truth — these should be the results of a liberal education. But it is never to be forgotten that more important still is the sense of responsibility to God and man, and an ever conscious acknowledgment of the power of an endless life.

DANIEL C. GILMAN.

BALTIMORE, *October*, 1883.

APPENDIX.

A.

Academic Staff, 1876-83.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN,		1875–

PROFESSORS.

BASIL L. GILDERSLEEVE,	*Greek*,	1876–
J. J. SYLVESTER,*	*Mathematics*,	1876–
IRA REMSEN,	*Chemistry*,	1876–
HENRY A. ROWLAND,	*Physics*,	1876–
H. NEWELL MARTIN,	*Biology*,	1876–
CHARLES D. MORRIS,	*Classics, (Collegiate)*,	1876–
PAUL HAUPT,	*Shemitic Languages*,	1883–

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS,	*History*,	1883–
MAURICE BLOOMFIELD,	*Sanskrit*,	1883–
WILLIAM K. BROOKS,	*Morphology*,	1883–
THOMAS CRAIG,	*Applied Mathematics*,	1883–
CHARLES S. HASTINGS,	*Physics*,	1883–
HARMON N. MORSE,	*Chemistry*,	1883–
WILLIAM E. STORY,	*Mathematics*,	1883–
MINTON WARREN,	*Latin*,	1883–

* Professor Sylvester, having consented to stand as a candidate for the Savilian Professorship of Geometry in the University of Oxford, tendered his resignation to the Trustees of the Johns Hopkins University to take effect January 1, 1884. In accepting it, the Trustees appointed him Professor *emeritus*.

ASSOCIATES.

JOHN M. CROSS,	*Greek*,	1876–1881.
PHILIP R. UHLER,	*Natural History*,	1876–
AUSTIN SCOTT,	*History*,	1876–1882.
A. MARSHALL ELLIOTT,	*Romance Philology*,	1876–
THOMAS C. MURRAY,	*Shemitic*,	1876–1879.
HERMAN C. G. BRANDT,	*German*,	1876–1882.
WILLIAM K. BROOKS,	*Biology*,	1876–1883.
HARMON N. MORSE,	*Chemistry*,	1876–1883.
ROBERT RIDGWAY,	*Natural History*,	1876–1877.
WILLIAM E. STORY,	*Mathematics*,	1876–1883.
ARTHUR W. TYLER,	*Librarian*,	1876–1878.
CHARLES S. HASTINGS,	*Physics*,	1876–1883.
CHARLES R. LANMAN,	*Sanskrit*,	1877–1880.
HERBERT B. ADAMS,	*History*,	1878–1883.
ALBERT S. COOK,	*English*,	1879–1881.
MINTON WARREN,	*Latin*,	1879–1883.
WILLIAM HAND BROWNE,	*Librarian*,	1879–
HENRY SEWALL,	*Biology*,	1880–1882.
THOMAS CRAIG,	*Mathematics*,	1880–1883.
MAURICE BLOOMFIELD,	*Sanskrit*,	1881–1883.
WILLIAM T. SEDGWICK,	*Biology*,	1881–1883.
HENRY WOOD,	*English*,	1881–
FABIAN FRANKLIN,	*Mathematics*,	1882–
RICHARD T. ELY,	*Political Economy*,	1882–
J. FRANKLIN JAMESON,	*History*,	1883–
GEORGE H. WILLIAMS,	*Mineralogy*,	1883–

LECTURERS.

SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*,	1877.
FRANCIS J. CHILD,	*Early English, etc.*,	1877–1878.
THOMAS M. COOLEY,	*Law*,	1877–1879.
JULIUS E. HILGARD,	*Geodetic Surveys*,	1877.
JAMES RUSSELL LOWELL,	*Romance Literature*,	1877.
JOHN W. MALLET,	*Technological Chemistry*,	1877–1878.
FRANCIS A. WALKER,	*Political Economy*,	1877–1878.

William D. Whitney,	*Comparative Philology,*	1877.
William F. Allen,	*History,*	1878.
William James,	*Psychology,*	1878.
George S. Morris,	*Philosophy,*	1878–1879.
J. Lewis Diman,	*History,*	1879.
H. Von Holst,	*History,*	1879.
William G. Farlow,	*Botany,*	1879.
J. Willard Gibbs,	*Theoretical Mechanics,*	1879.
Sidney Lanier,	*English Literature,*	1879–1881.
Charles S. Peirce,	*Logic,*	1879–1883.
John Trowbridge,	*Physics,*	1880.
A. Graham Bell,	*Phonology,*	1881.
S. P. Langley,	*Physics,*	1881.
John McCrady,	*Biology,*	1881.
James Bryce,	*Political Science,*	1881.
Edward A. Freeman,	*History,*	1881.
John J. Knox,	*Banking,*	1881.
Arthur Cayley,	*Mathematics,*	1882.
William W. Goodwin,	*Plato,*	1882.
G. Stanley Hall,	*Psychology,*	1882–1883.
Richard M. Venable,	*Constitutional Law,*	1882.
James A. Harrison,	*Anglo-Saxon,*	1882.
J. Rendel Harris,	*New Testament Greek,*	1882–1883.
George W. Cable,	*English Literature,*	1883.
Hiram Corson,	*English Literature,*	1883–1884.
F. Seymour Haden,	*Etchers and Etching,*	1883.
John S. Billings,	*Municipal Hygiene,*	1883.
James Bryce,	*Roman Law,*	1883.
H. Von Holst,	*Political Science,*	1883.
William Trelease,	*Botany,*	1884.
J. Thacher Clarke,	*Archæology,*	1884.

INSTRUCTORS AND ASSISTANTS.

Henry Sewall,	*Biology,*	1876–1878.
Samuel F. Clarke,	*Biology,*	1879–1881.
Fabian Franklin,	*Mathematics,*	1879–1882.
Lyman B. Hall,	*Chemistry,*	1879–1880.
Christian Sihler,	*Biology,*	1879–1880.

HENRY C. ADAMS,	*Political Economy*,	1879–1881.
THOMAS CRAIG,	*Mathematics*,	1879–1880.
CHAS. L. WOODWORTH, JR.	*Elocution*,	1879–
WILLIAM T. SEDGWICK,	*Biology*,	1880–1881.
EDWIN H. HALL,	*Physics*,	1880–1881.
GEORGE H. STOCKBRIDGE,	*Latin and German*,	1880–1881.
PHILIPPE B. MARCOU,	*French*,	1880–1883.
HUGH NEWELL,	*Drawing*,	1880–
R. DORSEY COALE,	*Chemistry*,	1881–1883.
RICHARD T. ELY,	*Political Economy*,	1881–1882.
LAWRENCE B. FLETCHER,	*Physics*,	1881.
GEORGE F. NICOLASSEN,	*Greek and Latin*,	1881–1882.
BENJAMIN E. SMITH,	*Philosophy*,	1881–1882.
EDMUND B. WILSON,	*Biology*,	1881–1882.
JAMES W. BRIGHT,	*German*,	1882–1883.
J. FRANKLIN JAMESON,	*History*,	1882–1883.
EDWARD H. SPIEKER,	*Greek and Latin*,	1882–
HARRY F. REID,	*Physics*,	1882–
CHARLES F. RADDATZ,	*German*,	1882–
EDWARD M. HARTWELL,	*Physical Culture*,	1883–
HERBERT W. CONN,	*Osteology*,	1883–
G. THEODORE DIPPOLD,	*German*,	1883–
HENRY H. DONALDSON,	*Animal Physiology*,	1883–
HENRY A. TODD,	*Romance Languages*,	1883–
OTTO LUGGER,	*Curator of Biol. Museum*,	1883–

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

HENRY C. ADAMS, PH. D., . . *Political Science*, . 1876–1879
Non-Resident Professor, Cornell University; Lecturer on Political Economy, University of Michigan.

HERBERT B. ADAMS, PH. D., . . *History*, . . . 1876–1878.
Associate Professor of History, Johns Hopkins University.

WILLIAM K. BROOKS, PH. D., . *Biology*, . . . 1876.
Associate Professor of Morphology, and Director of Chesapeake Zoölogical Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).

THOMAS CRAIG, PH. D., . . . *Mathematics*, . . 1876–1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.

JOSHUA W. GORE, C. E., . . *Mathematics*, . . 1876–1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.

GEORGE B. HALSTED, PH. D., . . *Mathematics*, . . 1876–1878.
Instructor in the Graduate Courses of Mathematics, Princeton College.

EDWARD HART, PH. D., . . . *Chemistry*, . . 1876–1878.
Assistant Professor of Chemistry, Lafayette College.

DANIEL W. HERING, C. E., . . *Engineering*, . . 1876–1878.
Professor of Mathematics, Western Maryland College.

MALVERN W. ILES, PH. D., . . *Chemistry*, . . 1876–1878.
Chemist, Leadville, Colorado.

WILLIAM W. JACQUES, PH. D., . *Physics*, . . . 1876–1879.
Electrician of the American Bell Telephone Co., Boston, Mass.

CHARLES R. LANMAN, PH. D., . *Sanskrit*, . . . 1876–1877.
Professor of Sanskrit, Harvard University.

D. MCGREGOR MEANS, A. B., . . *Political Science*, . 1876–1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.

HARMON N. MORSE, PH. D., . . *Chemistry*, . . 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).

WALTER H. PAGE, ... *Greek*, . . . 1876–1878.
Late Professor in the Louisville (Ky.) High School.

P. PORTER POINIER, M. E., . . *Physics*, . . . 1876.
(*Died without entering upon the Fellowship, June*, 1876, *aged 23 years*).

E. DARWIN PRESTON, C. E. . . *Engineering*, . . 1876–1878.
U. S. Coast and Geodetic Survey, Washington, D. C.

HENRY J. RICE, SC. D., . . . *Biology*, . . . 1876–1878.
Professor of Natural Sciences, Brooklyn (N. Y.) High School.

JOSIAH ROYCE, PH. D., . . . *Philosophy*,[1] . . 1876–1878.
Instructor in Philosophy, Harvard University.

ERNEST G. SIHLER, PH. D., . . . *Greek*, . . . 1876–1879.
Classical Instructor, New York City.

FREDERICK B. VAN VORST, A. B., . *Ethics & Metaphysics*, 1876–1877.
Attorney at Law, New York City.

JOHN H. WHEELER, PH. D., . . *Philology*, . . . 1876–1877.
Professor of Greek, University of Virginia.

SAMUEL F. CLARKE, PH. D., . . *Biology*, . . . 1876–1879.
Professor of Natural History, Williams College.

LYMAN B. HALL, PH. D., . . *Chemistry*, . . 1877–1879.
Professor of Chemistry and Physics, Haverford College, Pa.

A. DUNCAN SAVAGE, B. LITT., . *Greek*, . . . 1876–1879.

FABIAN FRANKLIN, PH. D., . . *Mathematics*, . . 1877–1879.
Associate in Mathematics, Johns Hopkins University.

CHRISTIAN SIHLER, PH. D., . . *Biology*, . . . 1877–1879.
Physician, Cleveland, Ohio.

FRANCIS G. ALLINSON, PH. D., . *Greek and Sanskrit*, . 1877–1880.
Assistant Professor of Greek and Latin, Haverford College, 1880-82; Classical Instructor, Baltimore.

MAURICE BLOOMFIELD, PH. D., . *Sanskrit and Greek*, . 1878–1879.
Associate Professor of Sanskrit, Johns Hopkins University.

CONSTANTINE FAHLBERG, PH. D., . *Chemistry*, . . 1878–1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.

EDWIN H. HALL, PH. D., . . *Physics*, . . . 1878–1880.
Instructor in Physics, Harvard University.

EDWARD COLES HARDING, A. M., . *Greek*, . . . 1878–1879.
Professor of Greek, University of Louisiana, 1879–80.

ISAAC OTT, M. D., ... *Biology*, . . . 1878–1879.
Physician, Easton, Pa.

HENRY SEWALL, PH. D., . . *Biology*, . . . 1878–1879.
Professor of Physiology, University of Michigan.

WASHINGTON I. STRINGHAM, PH. D., *Mathematics*, . . 1878–1880.
Professor of Mathematics, University of California.

ABRAM V. E. YOUNG, PH. B., . *Chemistry*, . . 1878–1880.

CHARLES R. HEMPHILL, A. M., . *Greek*, . . . 1878–1879.
Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.

ALLAN MARQUAND, PH. D., . . *Logic and Ethics*, . 1877–1880.
Professor of the History of Art, Princeton College.

CHARLES A. VAN VELZER, S. B., . *Mathematics*, . . 1878–1881.
Assistant Professor of Mathematics, University of Wisconsin.

BROWN AYRES, S. B., . . . *Physics*, . . . 1879–1880.
Professor of Physics, University of Louisiana, New Orleans.

LOUIS BEVIER, PH. D., . . . *Greek*, . . . 1879–1881.
Instructor in Languages, Rutgers College, N. J.

EDWARD M. HARTWELL, PH. D., . *Biology*, . . . 1879–1881.
Instructor in Physical Culture, Johns Hopkins University.

JOHN R. MCD. IRBY, PH. D., . . *Mineralogy*, . . 1879–1880.
(*Died, March* 25, 1880, *aged* 25 *years*).

MITSURU KUHARA, PH. D., . . *Chemistry*, . . 1879–1881.
Curator of the Scientific Museums, University of Tokio, Japan.

OSCAR H. MITCHELL, PH. D., . . *Mathematics*, . . 1879–1882.
Professor of Mathematics, Marietta College.

EDWARD L. NICHOLS, PH. D , . . *Physics*, . . . 1879–1880.
Professor of Physics and Chemistry, Central University, Richmond, Ky.

WALDO S. PRATT, A. M. . . . . *Aesthetics, etc.*, . . 1879–1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.

WILLIAM T. SEDGWICK, PH. D., . *Biology*, . . . 1879–1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.

HERMANN VOORHEES, C. E. . . *Chemistry*, . . 1879.
(*Died without entering on the Fellowship, October* 14, 1879, *aged* 27 *years*).

CHARLES O. WHITMAN, PH. D., . *Biology*, . . . 1879.
Professor of Zoölogy, University of Tokio, Japan, 1879–81; Marine Station, Naples, 1881–82. (*Resigned before entering on the Fellowship*).

EDMUND B. WILSON, PH. D., . . *Biology*, . . . 1879–1881.
Lecturer on Biology, Williams College.

GEORGE F. NICOLASSEN, PH. D., . *Greek*, . . . 1879–1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.

WILLIAM BURNEY, PH. D., . . *Chemistry*, . . 1879–1880.
Professor of Chemistry, South Carolina Agricultural College.

ROBERT W. PRENTISS, S. B., . . *Mathematics*, . . 1879–1881.
Office of U S. Nautical Almanac, Washington, D. C.

JAMES W. BRIGHT, PH. D., . . *Teutonic Languages*, . 1880–1882.
Student of Philology in Europe.

BENJAMIN C. BURT, A. M., . . *Philosophy*, . . 1880–1881.
Assistant Professor of English and Rhetoric, University of Michigan.

SPENCER H. FREEMAN, A. M., . *Physics*, . . . 1880–1882.
Professor of Physics and Astronomy, Adelbert College, Cleveland, Ohio.

KAKICHI MITSUKURI, PH. D., .. *Biology*, . . . 1880–1881.
Professor of Zoölogy, University of Tokio, Japan.

BERNARD F. O'CONNOR, PH. D.. . *Romance Languages*, . 1880–1882.
Instructor in French, Columbia College.

CHASE PALMER, PH. D., . . . *Chemistry*, . . 1880–1882.
Professor of Chemistry, Massachusetts State Normal School, Salem.

HERBERT M. PERRY, A. B., . . *Mathematics*, . . 1880–1882.

WILLIAM L. ROWLAND, S. B. . . *Chemistry*, . . 1880.
(*Did not enter upon the Fellowship*).

EDWARD H. SPIEKER, PH. D., . . *Greek*, . . . 1880–1882.
Assistant in Greek and Latin, Johns Hopkins University.

MORRISON I. SWIFT, A. B. . . *Philosophy*, . . 1880–1882.
Instructor in Logic and Political Economy, Hobart College.

ARTHUR W. WHEELER, A. B., . *Physics*, . . 1880–1881.
(*Died, January* 6, 1881, *aged* 21 *years*).

R. DORSEY COALE, PH. D., . . *Chemistry*, . 1880–1881.
Lecturer on Chemistry, University of Maryland.

A. F. WILHELM SCHIMPER, PH. D., *Biology*, . . . 1880–1881.
University of Bonn, Germany.

LAWRENCE B. FLETCHER, PH. D., . *Physics*, . . 1880–1881.
Instructor in Physics, Wesleyan University, Middletown, Conn.

WILLIAM J. ALEXANDER, PH. D., . *Greek*, . . . 1881–1883.
Student of Philology in Europe.

EDWARD S. BURGESS, A. B., . . *Greek*, . . . 1881–1882.
Instructor, Washington (D. C.) High School.

WILLIAM J. COMSTOCK, PH. B., . *Chemistry*, . . 1881–1882.
Student of Chemistry, University of Munich.

WILLIAM C. DAY, Ph. D., . . *Chemistry*, . . 1881–1883.
Professor of Chemistry and Physics, St. John's College, Md.

HENRY H. DONALDSON, A. B., . . *Biology*, . . . 1881–1883.
Assistant in Biology, Johns Hopkins University.

WILLIAM P. DURFEE, PH. D., . *Mathematics*, . . 1881–1883.
Instructor in charge of the department of Mathematics, Hobart College.

GEORGE S. ELY, PH. D., . . . *Mathematics*, . . 1881–1883.
Professor of Mathematics, Buchtel College.

J. FRANKLIN JAMESON, PH. D., . *History*, . . . 1881–1882.
Associate in History, Johns Hopkins University.

C. HERSCHEL KOYL, A. B., . . *Physics*, . . . 1881–1883.

HENRY L. OSBORN, A. B., . . *Biology*, . . . 1881–1882.
Fellow by Courtesy, Johns Hopkins University.

HENRY N. STOKES, S. B , . . *Biology*, . . . 1881–1883.
Fellow by Courtesy, Johns Hopkins University.

BENJAMIN W. WELLS, PH. D., . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I.

BENJAMIN I. GILMAN, A. B., . . *Logic*, . . . 1881–1882.
Student in Harvard University.

CHARLES J. BELL, A. B., . . *Chemistry*, . . 1882.
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (*Did not enter upon the Fellowship*).

JAMES M. CATTELL, A. B., . . *Philosophy*, . . 1882–1883.

ELLERY W. DAVIS, S. B., . . *Mathematics*, . . 1882–

DAVID T. DAY, A. B., . . . *Chemistry*, . . 1882–

ALFRED EMERSON, PH. D., . . *Greek*, . . . 1882–

WILLIAM S. FLEMING, A. B., . *Greek*, . . . 1882–1883.
Professor of Greek and German, Davidson College.

ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, 1882–

HENRY R. GOODNOW, A. B., . . *Physics*, . . . 1882–1883.
Fellow by Courtesy, Johns Hopkins University.

ELGIN R. L. GOULD, A. B., . . *History*, . . . 1882–

ARTHUR S. HATHAWAY, S. B., . *Mathematics*, . . 1882–

WILLIAM H. HOWELL, A. B., . . *Biology*, . . . 1882–

ARTHUR L. KIMBALL, A. B., . . *Physics*, . . . 1882–1883.
Fellow by Courtesy, Johns Hopkins University.

HARRY F. REID, A. B., . . . *Physics*, . . . 1882.
Assistant in Physics, Johns Hopkins University.

EDWARD H. KEISER, S. B., . . *Chemistry*, . . 1882–

WILLIAM M. ARNOLT, B. D., . . *Greek*, . . . 1883–

GUSTAV BISSING, A. B., . . . *Mathematics*, . . 1883–

Adam T. Bruce, A. B.,	*Biology*,	1883–
Archibald L. Daniels, A. B.,	*Mathematics*,	1883–
John Dewey, A. B.,	*Philosophy*,	1883–
James R. Duggan, A. B.,	*Chemistry*,	1883–
Hans C. G. von Jagemann,	*Modern Languages*,	1883–
Gustav A. Liebig, Jr., A. B.,	*Physics*,	1883–
C. W. Emil Miller, A. B.,	*Greek*,	1883–
Charles A. Perkins, A. B.,	*Physics*,	1883–
Lewis T. Stevens, A. B.,	*Biology*,	1883–
Lewis W. Wilhelm, A. B.,	*History*,	1883–

C.

Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Non-Resident Professor of Political Economy, Cornell University.

THOMAS CRAIG. (F).
C. E., Lafayette, 1875.—Associate Professor of Mathematics, Johns Hopkins University.

JOSIAH ROYCE. (F).
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.

ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.

GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Instructor in the Graduate Courses of Mathematics, Princeton College.

EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.

WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Technology, 1876.—Electrician, Boston, Mass.

HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.
Engaged in mercantile pursuits, Baltimore.

CHASE PALMER. (F).
Professor of Chemistry, Massachusetts State Normal School.

EDWARD HENRY SPIKER. (F).
Assistant in Greek and Latin, Johns Hopkins University. (3)

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.

FABIAN FRANKLIN. (F).
Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.

EDWIN HERBERT HALL. (F).
A. B., Bowdoin, 1875. Instructor in Physics, Harvard University.

ALLAN MARQUAND. (F).
A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.

WASHINGTON IRVING STRINGHAM. (F).
A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

THOMAS MILTON BRADENKOPF.
Student of Theology, Boston University.

ALLEN KERR BOND.
M. D., University of Maryland, 1882.—Physician, Baltimore.

WILLIAM CATHCART DAY. (F).
Professor of Chemistry and Physics, St. John's College.

HENRY LAURENCE GANTT.
Late Instructor, McDonogh School; Student in the Stevens Institute of Technology.

EDGAR GOODMAN.
LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER.
Student of Theology, Virginia Theological Seminary.

ALEXANDER FRIDGE JAMIESON.
Instructor, Trenton, N. J.

*EDMUND ALLEN JARVIS.
Died, October 15, 1880, aged 22 years.

STEWART BRIAN LINTHICUM.
LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.

JOHN HANSON LOWE.
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

LEIGH CLINTON MORGAN.
Minister of the Protestant Episcopal Church, Brooklyn, N. Y.

NELSON PALMER.
Baltimore.

THOMAS PETTIGREW.
Creswell, N. C.

HARRY FIELDING REID. (F).
Assistant in Physics, Johns Hopkins University.

WILTZ RAYMOND STRICKLEN.
Minister of the Methodist Episcopal Church, Maryland.

LEWIS WEBB WILHELM. (F).
Fellow, Johns Hopkins University. (16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F).
A. B., Rutgers, 1878.—Student of Philology in Europe.

ROBERT DORSEY COALE. (F).
Lecturer on Chemistry, University of Maryland.

EDWARD ALLEN FAY.
A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F).
A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University.

SAMUEL GARNER.
A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.

EDWARD MUSSEY HARTWELL. (F).
A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Instructor in Physical Culture, Johns Hopkins University.

WILLIAM THOMPSON SEDGWICK. (F).
Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.

CHRISTIAN SIHLER. (F).
Concordia, 1866.—Physician, Cleveland, O.

EDMUND BEECHER WILSON. (F).
Ph. B., Yale, 1878.—Lecturer on Biology, Williams College. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN.
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

HENRY JOHNS BOWDOIN.
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

JOHN WILSON BROWN.
Baltimore.

DAVID TALBOTT DAY. (F).
Fellow, Johns Hopkins University.

WILLIAM HENRY HOWELL. (F).
Fellow, Johns Hopkins University.

JOHN JOHNSON.
Instructor, McDonogh School.

JAMES EDWARD KEELER.
Assistant, Allegheny (Pa.) Astronomical Observatory; now studying in Berlin.

EDWIN GEORGE RICHARDSON.
Clergyman of the Protestant Episcopal Church, Newark, N. J.

ADONIRAM JUDSON ROBINSON.
Instructor in Baltimore City College.

HENRY ROLANDO.
M. D., University of Maryland, 1883.—now connected with Presbyterian Hospital, New York City.

LEE SALE.
Student of Law, Louisville, Ky.

MACTIER WARFIELD.
Student of Medicine, University of Maryland. (12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F).
A. B., Lafayette, 1877.—Student of Philology in Europe.

JOHN FRANKLIN JAMESON. (F).
A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

MITSURU KUHARA. (F).
S. B., University of Tokio, 1877.—Curator of the Museums, University of Tokio.

ROBERT W. MAHON.
C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).
A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).
A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.
A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.

CHASE PALMER. (F.)
A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School.

EDWARD HENRY SPIEKER. (F).
A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.
LL. B., University of Maryland, 1883.—Attorney at Law, Maryland.

THOMAS ALEXIS BERRY.
Graduate Student, Johns Hopkins University.

GUSTAV BISSING. (F).
Fellow, Johns Hopkins University.

WALTER BERNARD CLARKSON.
Principal of the Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.
Instructor, Bloomfield, N. J.

LOUIS GARTHE.
Graduate Student, Johns Hopkins University.

EDWARD INGLE.
Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.
Student of Law, University of Maryland.

GUSTAV ADOLPH LIEBIG, JR. (F).
Fellow, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER. (F).
Fellow, Johns Hopkins University.

JAMES PAGE.
Graduate Student, Johns Hopkins University.

ALBERT GALLATIN PALMER.
Graduate Scholar, Johns Hopkins University.

ROBERT MILLER REESE.
Baltimore.

LEWIS TEBBETTS STEVENS. (F).
Fellow, Johns Hopkins University.

HERBERT THORNDYKE TIFFANY.
Student of Law, Baltimore. (15)

1883.

DOCTORS OF PHILOSOPHY.

WILLIAM JOHN ALEXANDER. (F).
A. B, University of London, 1876.—Student of Philology in Europe.

WILLIAM CATHCART DAY. (F).
A. B., Johns Hopkins University, 1880.—Professor of Chemistry and Physics, St. John's College, Maryland.

WILLIAM PITT DURFEE. (F).
A. B., University of Michigan, 1876.—Instructor in Mathematics, Hobart College.

GEORGE STETSON ELY. (F).
A. B., Amherst College, 1878.—Professor of Mathematics, Buchtel College.

KAKICHI MITSUKURI. (F).
Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F).
Bach. ès Lettres, Université de France, 1874.—Instructor in French, Columbia College. (6)

BACHELORS OF ARTS.

WILLIAM SHIRLEY BAYLEY.
Graduate Student, Johns Hopkins University.

MAURICE FELS.
Student of Law, Philadelphia.

DAVID STERRETT GITTINGS.
Student of Law, Baltimore.

WILLIAM BEATTY HARLAN.
Student of Law, University of Maryland.

GEORGE THEOPHILUS KEMP.
Graduate Student, Johns Hopkins University.

GONZALEZ LODGE.
Graduate Scholar, Johns Hopkins University.

WILLIAM EDGAR STRATTON.
Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS.
Engaged in Civil Engineering, (B. & O. R. R.)

HENRY VANPETERS WILSON.
Graduate Student, Johns Hopkins University.

WILLIAM JOHN WITZENBACHER.
Instructor in the McDonogh School. (10)

TOTAL (1878-83.)

DOCTORS OF PHILOSOPHY, ...	39
BACHELORS OF ARTS, ...	56

D.

Report of the Chesapeake Zoölogical Laboratory,

During its first six years, 1878-83.

To the President of the Johns Hopkins University:

SIR: In accordance with your request to prepare an outline or summary of the work of the marine laboratory during the six years of its existence, I have the pleasure to submit in connection with the report of the sixth session, the following review of the history of the five preceding years.

FIRST YEAR, (1878), AT FORT WOOL, VA.

In 1878, the Trustees of the Johns Hopkins University made a small appropriation, in order to enable a party of biological students to spend a few weeks at the seashore in the study of marine zoölogy under my direction. Permission was given us by the Secretary of War, through the influence of Maj. Gen. Q. A. Gillmore, to occupy the vacant buildings at Fort Wool. Prof. Spencer F. Baird also exerted his influence with the Secretary of War in our behalf, and aided us in many other ways; furnishing us with dredging apparatus and with three small row boats, which were used during the summer. The vacant buildings at Fort Wool were not sufficient for our accommodation, as only one of them was in sufficiently good repair for use, and the watchman in charge of the fort, Mr. Allen, readily consented to vacate for us all but one of the rooms in his house, and much of the success of our first season was due to his interest in our work.

Three students, who were not connected with the University, asked for permission to join our party, which, with these additions, consisted of eight persons, and we remained at the fort for seven weeks.

The scientific results of our season's work were printed in an illustrated volume, the cost of publishing which was born by citizens of Baltimore, among whom were Samuel M. Shoemaker, John W. Garrett, John W. McCoy, Enoch Pratt, P. R. Uhler, President Gilman, Professor Martin, and others.

Among these papers the most noteworthy were one on the "Development of Lingula" and one on the "Early Stages of Squilla." Both of these papers were reprinted in foreign journals, and their contents have since been incorporated in the best foreign text-books of zoölogy, such as Claus' "Zoölogie" and Balfour's "Comparative Embryology."

SECOND YEAR, (1879), AT CRISFIELD, MD., AND FORT WOOL, VA.

The appropriation for the maintenance of the laboratory was continued by the Trustees of the University for the next year.

In order to present an opportunity for studying the oyster beds of the Bay, and thus secure the coöperation of Maj. Ferguson, Assistant U. S. Fish Commissioner, I determined to open the laboratory at Crisfield, a point which is unfavorable in most other respects. The laboratory was accordingly opened at Crisfield on the 25th of June in three of the barges of the Maryland Fish Commission.

I stated in the preliminary announcement that the laboratory would be moved to some more desirable locality farther down the Bay, about July 10, but the transportation of the barges was attended with so much expense that I was not able to move them to the second station, and we occupied them at Crisfield until August 8. During part of this time, Maj. Ferguson's steam yacht, the Lookout, which he had fitted up with steam dredging apparatus for the purpose, was with us, and rendered valuable help in dredging and collecting. Through Maj. Ferguson's influence we also had the use of a small steam launch which was detailed for the purpose from the U. S. Navy.

Early in August the mosquitoes became so numerous as to render the barges uninhabitable, and we transferred our outfit to our old quarters at Fort Wool, which had again been placed at our service by Maj. Gen. Q. A. Gillmore, U. S. A., and where Mr. Allen again placed his private quarters at our service.

At the beginning of this session, which lasted for eleven weeks, a circular was issued by the University inviting other naturalists to avail themselves of our facilities, upon the payment of a small fee, and some of our party of twelve were persons who came from other institutions.

Among the more important of the published results of this season's work were a paper on the Development of the Oyster, one on the Metamorphosis of *Phornis*, one on the Development of the Squid, and one on the Metamorphosis of Panopaeus.

THIRD, FOURTH, AND FIFTH YEARS, (1880–82), AT BEAUFORT, N. C.

The next year, the Trustees of the University voted to continue the laboratory for three years more, and they provided a liberal annual appropriation for the current expenses, and they also voted that the sum of $4,500 be appropriated for the purchase of outfit, &c. After an examination of all the available localities, the town of Beaufort, N. C., about four hundred miles south of Baltimore, was selected as the site for the laboratory, and as a vacant house, suitable for the accommodation of a small party, was found there, it was rented for three years, and as none of the $4,500 was needed for the erection of a building, most of it was used, by the permission of the Trustees, in the purchase of two boats, for collecting. One of these, a Herreshoff launch, twenty-seven feet long, and

eight feet beam, was built for us in 1880, and the second, a sloop forty-seven feet long, and fourteen feet beam, was purchased in the summer of 1883.

The natural advantages of Beaufort are very great, as the fauna is exceptionally rich and varied, abounding in forms which are of peculiar interest.

The configuration of our coast line is such that Cape Hatteras, the most projecting point south of New York, deflects the warm water of the Gulf Stream away from the coast, and thus forms an abrupt barrier between a cold northern coast and a warm southern one. The fauna north of this barrier passes gradually into that of Southern New England, while the fauna south of the barrier passes without any abrupt change into that of Florida, but the northern fauna is sharply separated by Cape Hatteras from the southern.

As the laboratory of the U. S. Fish Commission and Mr. Agassiz's laboratory at Newport afford opportunities for work upon the northern fauna, it seemed best for us to select a point south of Cape Hatteras in order to study the southern fauna with the same advantages, and as Beaufort is the only town near the Cape which can be reached without difficulty, it was chosen as the best place for the laboratory.

The situation of this town is exceptionally favorable for zoölogical work, for the surrounding waters present such a diversity of conditions that the fauna is unusually rich and varied.

Close to the town there are large sand bars, bare for miles at low tide, and abounding in animal life. From these we could collect an unfailing supply of Amphioxus, Renilla, Limulus, Balanoglossus, Sea Urchins, and a great variety of Molluscs and Crustacea.

The mud flats furnished us with another fauna, and yielded a great variety of Annelids, a new set of species of Crustacea and Molluscs, Gephyreans, Echinoderms, and Polyps. The large salt marshes gave us a third fauna, and a short distance inland large swamps of brackish and fresh water furnished still other conditions of life.

As the town is situated at the point where Gore Sound connects Pamlico Sound with Bogue Sound, we were within easy reach of a continuous sheet of landlocked salt water more than a hundred miles long, and these Sounds furnished still another collecting and dredging ground, abounding in Corals, Gorgonias, Ascidians, Star Fish, Sea-Urchins, and a new set of Molluscs and Crustacea.

As most of the shores are flat and sandy those animals which live upon a sandy bottom are much more abundant than those which attach themselves to solid bodies, but the stone breakwaters at Fort Macon, the wharves at Beaufort and Morehead City, and the large oyster beds which are found in the Sounds furnish a proper habitat for many fixed animals, and yielded us a rich supply of Hydroids, Corals, Ascidians, Sea Anemones, Sponges, Cirripeds, &c. The ocean beach within a short distance of the town furnished still another fauna, and a sail of three miles from the laboratory carried us to a good locality for ocean dredging.

The greatest advantage of the locality is the richness of its pelagic fauna. There are very few points upon land which are so situated that the surface animals of mid-ocean can be procured in abundance for laboratory work, and as careful work is very difficult on shipboard, a laboratory which can be supplied with a good number of living pelagic animals presents opportunities for work in an extremely interesting and almost new field.

The Gulf Stream is constantly sweeping these animals northwards along the North Carolina coast, and as the tide sets in through Beaufort Inlet into the Sounds the floating animals are carried with it. Such oceanic animals as Physalia and Porpita were frequently thrown, uninjured and in perfect health, upon the beach within twenty feet of the laboratory, and during the season we found nearly all the Siphonophora which are known to occur upon our Atlantic coast.

With all these advantages we enjoyed a mild and uniform climate which enabled us to work in perfect comfort during the hottest months of summer.

The zoölogical resources of Beaufort have not escaped the attention of American naturalists, and there are few places upon our coast, outside of New England, where more zoölogical work has been done. In 1860, Drs. Stimpson and Gill spent a season in dredging and collecting in the vicinity of Beaufort, Cape Lookout, and Cape Hatteras, and an account of their work was published in the *American Journal of Science*. Dr. Coues, who was stationed at Fort Macon during the war, occupied himself for two years in collecting the animals which are found here, and he published a series of papers on the "Natural History of Fort Macon and Vicinity" in the *Proceedings of the Academy of Natural Sciences of Philadelphia*.

These papers, which were continued by Dr. Yarrow, contain copious and valuable notes on the habits and distribution of the animals which were observed, and we found them a great help to us. These two naturalists found four hundred and eighty species of animals in the vicinity of Beaufort. Of these four hundred and eighty, two hundred and ninety-eight are vertebrates, and one hundred and eighty-two are invertebrates. Of the vertebrates twenty-four are mammals, one hundred and thirty-three are birds, twenty-seven are reptiles, six batrachians, ninety-seven fishes and eleven selachians. Of the invertebrates one hundred and forty-seven are molluscs, twenty-one are crustaceans. The list of vertebrates is very nearly complete, and we made few additions to it, but the list of invertebrates is obviously very imperfect, and, although we made no attempt to tabulate the species which we observed, there would be no difficulty in enlarging the list twenty or thirty fold.

Among other naturalists who have spent more or less time at Beaufort, I may mention Professor L. Agassiz, Professor E. S. Morse, Dr. A. S. Packard, Professor Webster, and Professor D. S. Jordan. Professor Morse procured most of the material for his well known paper on the Systematic Position of the Brachiopoda on the sand bars in Beaufort Inlet.

During the years 1880, 1881, and 1882, the laboratory at Beaufort was occupied by our party for sixty-four weeks in all, and twenty-two persons availed themselves of its facilities for research.

Among the published results of our investigations, lists of which have been printed in your annual reports, two papers deserve especial mention.

One of these, a monograph on the Development of Lucifer, has been printed with eleven quarto plates in the *Philosophical Transactions of the Royal Society*, while another on the Anatomy and Development of Renilla, with fourteen plates, is now in the press of the Royal Society, and is to appear soon.

Sixth Year, (1883), at Hampton, Va.

In the spring of 1883, the Trustees of the University voted to continue the annual appropriation for the current expenses of the laboratory for two years more.

My duties this summer as a Commissioner, appointed by the Governor of Maryland to examine the condition of the oyster beds of the State, compelled me to spend the season in the Chesapeake Bay, and the removal of the laboratory from Beaufort, N. C., where it had been for three years, was therefore decided upon.

The absence of buildings for the accommodation of our party at any suitable point upon the Bay except at Fort Wool and Hampton, restricted us to these two places in our selection of a laboratory. Application was made to the Secretary of War, through Maj. Gen. Q. A. Gillmore, for permission to occupy the buildings at Fort Wool, and this permission was granted; but upon visiting the fort I found the buildings so ruinous, and the wharf so injured by storms, that I decided that it would not be prudent for our party to spend the season there, and as Gen. S. C. Armstrong, the President of the Hampton Normal and Industrial Institute, kindly consented to permit our party to use an unoccupied building which had just been erected by the Institute as a machine shop, the second floor and attic were rented by the University for the season, and were occupied by the members of our party from May 1 to October 1.

The second floor room, which is large and well lighted, furnished ample laboratory accommodations, and the attic was used as lodgings.

The location was found to be a bad one, as the collecting grounds were distant and far apart, and the fauna was not rich, but researches were carried on upon the following subjects, among others: the anatomy and development of barnacles, the anatomy and development of crabs, the histology of Eudendrium, the anatomy and development of Balanoglossus, the development of the oyster, the anatomy of Lingula, the protozoea stage of crabs, the development of Annelids, the anatomy and development of Chrysaora, the origin of the eggs of hybrids and tunicates, the function of the semi-circular canals of sharks, and the general zoölogy of the Hydro-Medusae. Most of my own time for the last year has been given to the study of the oyster industry of Maryland, and my results

will be stated in the report of the Oyster Commission, which is now in press.

PROPAGATION OF THE OYSTER.

During the past year experiments which have been carried on in France and in this country have resulted in the practical application of the methods of artificial oyster propagation, which were discovered at the laboratory five years ago, and the great economic importance of the subject will justify a short review of the history of these experiments.

Previously to 1879 our knowledge of the breeding habits of the oyster was entirely based upon the study of the oysters of northern Europe, and nothing whatever was known of the life history of the American oyster, as our writers had accepted without question the statements of foreign authorities. The oyster of northern Europe is hermaphrodite, and as the eggs are hatched inside the shell of the parent, and the young are thus carried and protected until they are ready to fasten themselves, good authorities had stated that it is not possible to rear oysters artificially.

In 1879, I found that the sexes are separate in the American oyster, and that the unfertilized eggs are thrown out in immense numbers into the water, where they are fertilized and develop without the need for any protection from their parents. I also showed that it is possible to fertilize the eggs artificially, and to rear the young oysters until long after they have acquired their shells, although I did not succeed in keeping them alive until they became attached. These experiments showed the perfect practicability of rearing oysters in unlimited numbers, as soon as the practical difficulties should be overcome.

A full account of my experiments and of the methods employed was published with figures of the early stages of the development of the oyster, in the first volume of the *Studies from the Biological Laboratory.*

While I was engaged in these experiments, Lieutenant Winslow, U. S. N., was engaged in surveying the oyster beds near the laboratory, which he visited in order to learn my methods. The next year, while stationed at Cadiz, Spain, he repeated the experiments with Portuguese oysters, and found that their breeding habits are exactly like those of the American species; that the sexes are separate; that the unfertilized eggs are thrown out into the water, and that the young can be reared from artificially fertilized eggs.

An account of his experiments was read before the Maryland Academy of Sciences in November, 1880, and it was afterwards published in the *American Naturalist.*

The next step which has resulted in the solution of the practical difficulties, and the rearing of oysters of economic value from artificially impregnated eggs, is due to experiments which were carried on by M. Bouchen-Brandely, under the auspices of the French Government.

In a paper, entitled "Rapport relatif à la génération et à la fécondation artificielle des huitres, adressé au ministre de la marine et des colonies par . Bouchen-Brandely, secrétaire du Collège de France," and published in

December, 1882, in the *Journal officiel de la République Française*, this author states that he was encouraged by the experiments which Brooks, of the Johns Hopkins University of Baltimore, had made upon *Ostrea virginica*, to attempt similar experiments with the Portuguese oyster, *Ostrea angulata*. He was ignorant of Winslow's experiments with this oyster, but after two years of experiments, he succeeded in independently establishing the fact that the sexes of the Portuguese oyster are separate; that the eggs are thrown out into the water; that the young are independent of parental protection, and that they can be reared from artificially fertilized eggs.

The methods by which he succeeded in rearing these young oysters are described in his report as follows. Two oyster planting ponds, separated from each other by a straight massive wall of earth, and having an area of about 100 metres each, and an average depth of about 1 metre, were placed in communication by means of a pipe which was closed at each end by a sponge, to filter sediment from the water and to guard against the accidental introduction of spat. The outlet from the ponds was guarded by a dam of fine sand confined between boards, and thus allowing the water to escape, but retaining the swimming embryos. Artificially impregnated eggs were then poured into the lower pond in great numbers during the latter part of June and the month of July. The pond was furnished with tiles for the attachment of the spat, and on July 24th each of these tiles was found to have, attached to its surface, twenty or thirty young oysters, about two-fifths of an inch in diameter. Finally, during the early part of October he states that he had the honor of presenting to the minister of the marine a tile, upon which two thousand young oysters could be counted, measuring from two-fifths to four-fifths of an inch in diameter.

This interesting paper, which has been translated into English by J. A. Ryder, and published in the *Bulletin of the U. S. Fish Commission* for April 19, 1883, shows the practicability of the economic application of the more purely scientific experiments which were carried on at our laboratory in 1879. The author acknowledges that he was incited by these experiments, and our own share in the work is therefore exactly what we should wish: the discovery of a new scientific truth, which has, in the hands of practical economists, contributed to the welfare of mankind.

Mr. John A. Ryder has this summer repeated these experiments in Maryland, and has shown that they are as successful here as they are in France. An account of his apparatus and of the results obtained has been published in the *Bulletin of the U. S. Fish Commission* for September 6, 1883, under the title "Rearing Oysters from Artificially Fertilized Eggs, together with notes on Pond Culture, &c.," by John A. Ryder.

Summary.

During the six years of its existence, work has been carried on at the laboratory for one hundred and five weeks in all. It was attended by nine persons in 1878; by twelve in 1879; by six in 1880; by twelve in

1881; by eight in 1882; and by sixteen in 1883, thus making the total attendance sixty-three. The number of persons who have used the laboratory is only forty however, as many of them have spent two or three seasons there. One-half of the attendants were members of the Johns Hopkins University, and the rest were then or now connected with the Smithsonian Institution; the United States Fish Commission; the Academy of Natural Sciences, Philadelphia; University of Cambridge (St. John's College), England; the Ontario Agricultural College, Canada; or with the American colleges and schools indicated in the subjoined roll.

The scientific papers which have been published by our party, based wholly or in part upon the work done at the laboratory, include fifty-five titles, and they have been printed in the following journals: *Studies from the Biological Laboratory; Johns Hopkins University Circulars; American Naturalist; American Journal of Science; Memoirs of the Boston Society of Natural History; Zoölogischer Anzeiger; London Quarterly Journal of Microscopical Science; Proceedings and Philosophical Transactions of the Royal Society*, London. Many of the papers have been reprinted, or summarized in foreign journals, but translations and summaries are not included in the enumeration given above.

A medal of the first class of the Société d'Acclimatation of Paris and one of the Walker Prizes of the Boston Society of Natural History have been awarded to members of our party for work which was done at the laboratory.

Within the last year Professor Mitsukuri, a naturalist who received his training in zoölogical research at our marine laboratory, has organized a similar laboratory on the coast of Japan, as a branch of the Government University of Tokio.

Yours respectfully,

W. K. BROOKS,
Director Chesapeake Zoölogical Laboratory.

ROLL OF THE CHESAPEAKE ZOÖLOGICAL LABORATORY, 1878–83.

Director.

W. K. BROOKS, Ph. D.

Members.

J. E. ARMSTRONG, *Assistant in Natural History, Illinois Industrial University.* (*1881.*)
B. W. BARTON, M. D., *Baltimore.* (*1879.*)
W. BATESON, *St. Johns College, University of Cambridge, England.* (*1882.*)
EMIL BESSELS, M. D., *Smithsonian Institution.* (*1879.*)
E. A. BIRGE, *Professor of Zoölogy, University of Wisconsin.* (*1879.*)

S. F. CLARKE, Ph. D., *Professor of Natural History, Williams College.* (*1879, '81.*)

BUEL P. COLTON, A. B., *Teacher, Natural Science, Princeton* (*Ill.*) *High School.* (*1881*)

H. W. CONN, A. M., *Johns Hopkins University.* (*1882, '83.*)

CHARLES EARLE, *New York.* (*1883.*)

H. C. EVARTS, M. D., *Philadelphia.* (*1879, '80.*)

H. GARMAN, *Assistant, Illinois State Laboratory of Natural History.* (*1883.*)

O. P. JENKINS, A. M., *Johns Hopkins University.* (*1883.*)

J. W. KING, *Professor of Natural Science, Wisconsin State Normal School.* (*1880.*)

F. S. LEE, A. M., *Johns Hopkins University.* (*1883.*)

K. MITSUKURI, Ph. D., *Professor of Zoölogy, University of Tokio, Japan.* (*1879, '80.*)

J. PLAYFAIR MCMURRICH, *Professor of Biology, Ontario Agricultur al College, Guelph, Ont.* (*1881, '83.*)

T. W. MILLS, M. D., *Montreal, Quebec.* (*1883.*)

H. F. NACHTRIEB, S. B., *Johns Hopkins University.* (*1883.*)

W. L. NORRIS, *Arlington, Ill.* (*1881.*)

E. A. NUNN, *Professor of Biology, Wellesley College, Mass.* (*1879.*)

H. L. OSBORN, A. B., *Johns Hopkins University.* (*1882, '83.*)

HENRY F. OSBORNE, A. B., *Fellow, College of New Jersey.* (*1880.*)

J. H. PILLSBURY, *Professor of Natural Science, Springfield* (*Mass.*) *High School.* (*1882, '83.*)

H. J. RICE, M. S., *Teacher of Natural Science, Brooklyn, N. Y.* (*1879, '81.*)

FERNANDO SANFORD, *Professor, Natural Sciences, Mount Morris College, Ill.* (*1881.*)

AUGUST SCHMIDT, *Teacher of Natural Science, Baltimore.* (*1878, '79.*)

H. SEWALL, Ph. D., *Professor of Physiology, University of Michigan.* (*1878, '81, '83.*)

C. SIHLER, Ph. D., *Physician, Cleveland, Ohio.* (*1878, '79.*)

W. E. STRATTON, A. B., *Johns Hopkins University.* (*1883.*)

A. H. TUTTLE, S. B., *Professor of Zoölogy, Ohio State University, Columbus, Ohio.* (*1883.*)

JOHN M. TYLER, A. B., *Professor of Zoölogy, Amherst College.* (*1882.*)

P. R. UHLER, *Associate in Natural History, J. H. U.* (*1881.*)

N. B. WEBSTER, *Principal, Military Academy, Norfolk, Va.* (*1878.*)

T. B. WEBSTER, *Teacher, Military Academy, Norfolk, Va.* (*1878.*)

E. B. WILSON, Ph. D., *Lecturer on Biology, Williams College.* (*1879–82.*)

H. V. WILSON, A. B., *Johns Hopkins University.* (*1883.*)

J. M. WILSON, M. D., *Ann Arbor, Mich.* (*1882.*)

FRANCIS WINSLOW, *Lieut. United States Navy, United States Fish Commission.* (*1882, '83.*)

PUBLISHED RESULTS OF SCIENTIFIC RESEARCH AT THE CHESAPEAKE ZOÖLOGICAL LABORATORY, 1878-83.

W. K. BROOKS, PH. D.:

The Development of Lingula and the Systematic Position of the Branchiopods. (*Scientific Results, Chesapeake Zoöl. Lab.*, 1879; *Arch. f. Zoöl. exp.*, 1881.)

The Larval Stages of Squilla empusa. (*Scientific Results, Chesapeake Zoöl. Lab.*, 1879.)

Abstract of Observations on the Development of the American Oyster. (*Zoöl. Anzeiger*, 1879.)

The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (*Am. Jour. of Science*, 1879.)

The Development of the American Oyster. (*Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U.*, 1880.)

The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (*Studies from the Biol. Lab., J. H. U.*, 1880; 10 *plates.*)

The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (*Am. Jour. of Science*, 1880.)

The Rhythmical Character of Segmentation. (*Am. Jour. of Science*, 1880.)

Budding in Free Medusæ. (*Am. Nat., Sept.*, 1880.)

Embryology and Metamorphosis of the Sergestidæ. (*Zoöl. Anzeiger, Nov.*, 1880.)

The Young of the Crustacean Lucifer, A Nauplius. (*Am. Nat., Nov.*, 1880.)

The Development of the Squid. (*Anniv. Mem., Boston Soc. Nat. Hist., March*, 1881; 3 *plates.*)

Alternation of Periods of Rest with Periods of Activity in the Segmenting Eggs of Vertebrates. (*Studies from the Biol. Lab., J. H. U.*, 1881; 1 *plate.*)

The First Zoea of Porcellana. (With E. B. WILSON; *Studies from the Biol. Lab., J. H. U.*, 1881; 2 *plates.*)

List of the Medusæ of Beaufort, N. C. I. (*Studies from the Biol. Lab., J. H. U.*, 1882.)

Origin of the Eggs of Salpa. (*Studies from the Biol. Lab., J. H. U.*, 1882; 1 *plate.*)

Lucifer: A Study in Morphology. (*Proc., Royal Soc., London*, 1881.)

The Development of Lucifer. (*Phil. Trans. Royal Soc., London*, 1882; 11 *plates.*)

Handbook of Invertebrate Zoölogy. (*Boston, Cassino*, 1882.)

Chamisso and the Discovery of Alternation of Generations. (*Zoöl. Anzeiger*, 1882.)

The Development of the Digestive Tract in Molluscs. (*Proc., Boston Soc. Nat. Hist.*, 1879.)

The Metamorphosis of Alpheus. (*Univ. Circular, No.* 17.)

The Metamorphosis of Penæus. (*Univ. Circular, No.* 19.)

On the Origin of Alternation of Generations in Hydro-Medusæ. (*Univ. Circular, No.* 22; *Ann. of Nat. Hist.*, Vol. 11, p. 455.)

Notes on the Medusæ of Beaufort, N. C. II. (*Studies from the Biol. Lab., J. H. U.*, 1883.)

The Law of Heredity. (*Baltimore, Murphy*, 1883.)

W. BATESON:

Abstract of Observations on the Development of Balanoglossus. (*Univ. Circular, No.* 27.)

H. G. BEYER, M. D.—(See H. W. Conn.)

E. A. BIRGE:

Notes on the Development of Panopæus Sayi. (*Studies from the Biol. Lab., J. H. U.*, 1883, 4 *plates.*)

S. F. CLARKE, PH. D.:

New Hydroids from Chesapeake Bay. (*Boston Soc. Nat. Hist.*, 1882.)

B. P. COLTON, A. B.—(See H. Garman.)

H. W. CONN, A. M.:

Development of Tubularia Cristata. (*Univ. Circular, No.* 17.)

On Radial and Bilateral Symmetry in Animals. (*Univ. Circular, No.* 22; *Ann. of Nat. Hist.*, Vol 12, p. 69; *Journal Royal Mic. Soc.*, Vol. 3, p. 633.)

An Instance of Sexual Variation in the Crustacea. (*Univ. Circular, No.* 27.)

Evidence of a Protozoea Stage in Crab Development. (*Univ. Circular, No.* 28.)

The Nervous System of Porpita. (With H. G. BEYER. *Studies from the Biol. Lab. J. H. U.*, 1883, 1 *plate.*)

On the Development of Crabs. (*Studies from the Biol. Lab., J. H. U., in press.*)

H. GARMAN:

List of a few additions to the Species of Birds, Reptiles, and Batrachians mentioned in Dr. Elliott Coues' paper on the Natural History of Fort Macon and Vicinity. (*Univ. Circular, No.* 22.)

Development of Arbacia punctulata. (With B. P. COLTON. *Studies from the Biol. Lab., J. H. U.*, 1881.)

J. P. MCMURRICH:

Origin of the so-called Test Cells in the Ascidian ovum. (*Studies from the Biol. Lab., J. H. U.*, 1882.)

Abstract of Observations on the Osteology and Development of Syngnathus Peckeanus (Storer.) (*Univ. Circular, No.* 27.)

On the Osteology and Development of Syngnathus Peckeanus (Storer.) (*Quart. Journal Micros. Science, Vol. XXIII*, 2 *plates.*)

K. MITSUKURI, PH. D.:

On the Structure and Significance of some Abberant Forms of Lamellibranchiate Gills. (*Quar. Jour. Micros. Sci., July*, 1881; *Studies from the Biol. Lab., J. H. U.*, 1882)

H. L. OSBORN, A. B.:

The Structure and Growth of the Shell of the Oyster. (*Studies from the Biol. Lab., J. H. U.*, 1882, 1 *plate.*)

On the Growth of the Molluscan Shell. (*Univ. Circular, No.* 27; *Ann. of Nat. Hist. Vol.* 11, *p.* 149; *Am. Nat., Vol.* 17, *p.* 96; *Journal Royal Micros. Soc., Vol.* 3, *p.* 195.)

On the Gills of Gasteropods. (*Studies from the Biol. Lab., J. H. U., in press.*)

—Also see J. M. WILSON.

H. SEWALL, PH. D.:

On the Equilibrium Function of the Membraneous Labyrinth in Cartilaginous Fishes. (*Univ. Circular, No.* 12.)

P. R. UHLER:

List of Animals observed at Fort Wool, Va. (*Studies from the Biol. Lab. J. H. U.*, 1879.)

N. B. WEBSTER:

Partial List of Land Plants at Fort Wool, Va. (*Studies from the Biol. Lab., J. H. U.*, 1879.)

E. B. WILSON, PH. D.:

The Early Stages of Renilla. (*Am. Jour. of Science*, 1880)

Origin and Significance of the Metamorphosis of Actinotrocha. (*Quar. Jour. of Micros. Sc., April*, 1881, 2 *plates; Abstract in Am. Nat.*, 1882.)

The First Zoea of Porcellana. (With W. K. BROOKS; *Studies from the Biol. Lab., J. H. U.*, 1881, 2 *plates.*)

Observations on the Early Developmental Stages of some Polychætous Annelides. (*Studies from the Biol. Lab., J. H. U.*, 1882; *Abstract in Zoöl. Anzeiger*, 1880, *and in Am. Jour. of Science*, 1880.)

A New Species of Pilidium. (*Studies from the Biol. Lab., J. H. U.*, 1882.)

Abstract of Observations on the Structure and Development of Renilla and Leptogorgia. (*Univ. Circular, No.* 17.)

The Development of Renilla: (*Proc., Royal Soc., London, No.* 222; *Univ. Circular, No.* 22.)

—Also see J. M. WILSON and W. K. BROOKS.

J. M. WILSON, M. D.:

Variation in the Segmentation of the Egg of Renilla. (With E. B. WILSON and H. L. OSBORN; *Zoöl. Anzeiger*, 1882, No. 123.)

Dr. E. B. Wilson's monograph on the Development of Renilla is now in print, and it will soon appear with sixteen quarto plates, in the *Philosophical Transactions of the Royal Society.* Several other papers are now ready for publication. One of these, a paper on the Development of Thallassima, by Mr. H. W. Conn, has received one of the Walker prizes of the Boston Society of Natural History.

E.

Gifts to the Library from September 1, 1882, to September 1, 1883.

ACADEMIA REAL DAS SCIENCIAS, LISBON, PORTUGAL. Arana. Vida e viagens de Magalhães. Lisbon, 1881. O.
Ribeiro. Calderon de la Barca. Lisbon, 1881. O.
Shakespeare. Hamlet. Trad. de B. Pato. Lisbon, 1879. O.
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ADDEMAN, HON. J. M. Secretary of State of Rhode Island. State Laws and Documents.
ASIATIC SOCIETY OF BENGAL. Bibliotheca Indica (a large collection of Sanskrit texts) and other publications. Calcutta. O.
Oriental Biographical Dictionary. Calcutta, 1881. Q.
ATKINSON, W. B., M. D. Phila. Transactions Amer. Medical Association. 1882. O.
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BAXTER, J. H., M. D. Washington. Medical Statistics of Prov. Marshal Gen'l's Bureau, Washington, 1875. 2 vols. Q.
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BILLINGS, J. S., M. D. Index-Catalogue, Library of Surgeon Gen'l's Office. Vol. 3. Washington, 1882. Q.
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COOPER, P. (Author). Ideas of a Science of Good Government. New York, 1883. O.
COURTENAY, HON. W. A. (Mayor of Charleston, S. C.) Year-Book of the City of Charleston, 1880-81. Charleston, 1881-82. 2 vols. O.
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HILL, H. A. (Author). Memoir of Abbott Lawrence. Boston, 1883. O.
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Robinson, E. G. Yale Lectures on Preaching. N. Y., 1883.
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Maine, H. S. Early Law and Custom. N. Y., 1883.
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MASON, REV. P. H. (Author). Elementary Hebrew Grammar. Cambridge, Eng., 1877. O.
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MASON, J. J., M. D. (Author). Nervous System of Reptiles. Newport, 1882. F.
MCLANE, HON. R. M. Official Records of the Union and Confederate Armies. 8 vols.; and other Public Documents.
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MORRIS, PROF. G. S. (Author). Kant's Critique of Pure Reason. Chicago, 1882. D.
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PEIRCE, HON. H. B. (Secretary of the Commonwealth of Massachusetts.) Acts and Resolves of the Province of Massachusetts Bay. 4 vols. Boston, 1869-82. Q.
PERKINS, HON. GEO. C. (Governor of California). Official and State Documents.
PERRY, AMOS. (Librarian, R. I. Historical Society.) Proceedings of the Society.
PETERS, PROF. C. H. F. Clinton, New York. (Author). Celestial Charts, Nos. 1-20. Clinton, New York. F.
PHILADELPHIA SOCIAL SCIENCE ASSOCIATION. Proceedings and Publications.
POWELL, J. W. Pamphlets and Addresses, Historical and Sociological.
ROBB, J. A. (City Register). Financial Reports of Mayor, etc., for 1882. Baltimore, 1883. O.
ROBERTS, J. B., M. D. (Author). Clinical History of Peripheric Abscess. Phila., 1883. O.
SCUDDER, S. H. (Author). Pine Moths of Nantucket. Boston, 1883. O.
SCULL, G. D., Oxford, Eng. (Author). The Evelyns in America. Oxford, 1881. Q.
SHUFELDT, R. W., M. D. Washington. (Author). Contributions to Anatomy of Birds. Washington, 1882. O.
SMYTH, C. PIAZZI, F. R. S. E., &c. (Author). Madeira Meteorologic. Edinburgh 1882. O.
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SYLVESTER, PROF. J. J. Byerly. Elements of Differential Calculus. Boston, 1879. O.
TAYLOR, C. Cambridge University, England. (Author). Geometry of Conics. Cambridge, 1881. O.
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THOMPSON, W. G. (Author). Training-Schools for Nurses. New York, 1883. D.
THURSTON, PROF. R. H. (Author). Conversion Tables of Weights and Measures. New York, 1883. O.

TRINITY COLLEGE, DUBLIN. (Provost and Senior Fellows). Codex rescriptus Dublinensis. (Ancient text of St. Matthew's Gospel.) Dublin, 1880. F.
Casey. Sequel to Euclid. Dublin, 1882. D.
Leslie. Essays in Political and Moral Philosophy. Dublin, 1879. O.
Tyrrel. Translations into Greek and Latin Verse. Dublin, 1882. O.
Tyrrel. Acharnians of Aristophanes. Dublin, 1883. D.
Tyrrel. Correspondence of Cicero. I. Dublin, 1879. O.
Burnside and Panton. Equations. Dublin, 1881. O.
Maguire. Parmenides of Plato. Dublin, 1882. O.
Haughton. Lectures on Physical Geography. Dublin, 1880. O.
Monck. Introduction to Logic. Dublin, 1880. D.
Graves. Life of Sir W. R. Hamilton. I. Dublin. 1882. O.
Dowden. Correspondence of Southey. Dublin, 1881. O.
Macalister. Morphology of Vertebrate Animals. Dublin, 1878. O.
MacCullagh. Collected Works. Dublin, 1880. O.
Webb. Goethe's Faust. Dublin, 1880. O.
Griffin. Parabola, Ellipse, and Hyperbola. Dublin, 1879. D.

UNIVERSITY OF CHRISTIANIA, NORWAY. Weisse. Die latein. partikel. Christiania, 1882. O.
Daae. King Christian I. Christiania, 1879. O.
Lie. Classification der Flächen. Christiania, 1879. Q.
Stevensen. Myntfundet. Christiania, 1881. Q.
Hiortdahl. Krystallographische Untersuchungen. Christiania, 1881. Q.
Gamborg. Seddelbanken. Christiania, 1877. O.
Hertzberg. Seddelbanken. Christiania, 1877. O.
Kiaer. Seddelbanken. Christiania, 1877. O.
Kiaer. Skibsfarten. Christiania, 1877. O.
Hertzberg. Kredit. Christiania, 1877. O.
Brandt. Den aeldste Norske Process. Christiania, 1874. O.
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U. S. DEPARTMENT OF STATE. 5 Cases of Books containing about 700 vols. Government Publications.

U. S. NAVY DEPARTMENT. Nautical Almanac Office. (Lieut. E. W. Sturdy, U. S. N., Supt). 28 vols. of American Ephemeris.

U. S. WAR DEPARTMENT. Alphabetical Catalogue of Library. Washington, 1882. Q.

WASHBURN OBSERVATORY, UNIVERSITY OF WISCONSIN. Publications I. Madison, 1882. O.

WHITEHEAD, WILLIAM A. New Jersey Archives.

WILLIAMS, R. S. Publications of the Oneida Historical Society. Historical Pamphlets and State Laws.

WYOMING HISTORICAL AND GENEALOGICAL SOCIETY. Proceedings, Addresses, Miscellaneous Pamphlets.

Besides Public Documents from the various Departments at Washington, and valuable pamphlets from:

Rev. A. J. Perry, Prof. S. H. Gage, Prof. E. C. Pickering, Hon. S. A. Green, Mr. F. C. Whitehouse, Prof. P. Frazer, Mr. H. C. Bolton, Hon J. H. B. Latrobe, and many other donors.

In response to a special circular from the Historical Department valuable contributions of municipal documents, etc., were received from Mayors Edson (New York), Low (Brooklyn), Whyte and Latrobe (Baltimore), Green and Palmer (Boston), Hayward (Providence), Farley (Cleveland), Romeis (Toledo), Harrison (Chicago), Sullivan (St. Louis), Gibson (Kansas City), Bartlett (San Francisco), and Courtenay (Charleston).

W. H. B.

F.

List of Foreign Exchanges.

The following list gives the names of the foreign societies and journals with which a regular exchange of publications is made by the university.

GERMANY AND AUSTRIA.

Berlin. Königliche akademie der wissenschaften.
Deutsche chemische gesellschaft.
Jahrbuch über die fortschritte der mathematik.
Journal für reine und angewandte mathematik. (Crelle.)
Der naturforscher.
Zeitschrift für deutsches alterthum.
Zeitschrift für völkerpsychologie und sprachswissenschaft.
Braunschweig. Archiv für das studium der neueren sprachen.
Cassel. Verein für naturkunde.
Cöthen. Chemiker zeitung.
Giessen. Jahresbericht über die chemie und physik.
Göttingen. Königliche gesellschaft der wissenschaften.
Beiträge zur kunde der indogermanischen sprachen.
Halle. Beiträge zur geschichte der deutschen sprache.
Heidelberg. Naturhistorisch-medicinische verein.
Heilbronn. Englische studien.
Literaturblatt f. german. und roman. philologie.
Jena. Jenaische zeitschrift für naturwissenschaften.
Kiel. University of.
Astronomische nachrichten.
Leipzig. K. Sächsische gesellschaft der wissenschaften.
Archiv der mathematik und physik. (Grunert.)
Archiv für lateinische lexikographie.
Jahrbücher für classische philologie.
Liebig's annalen der chemie. (Wöhler, Kopp.)
Literaturblatt für orientalische philologie.
Mathematische annalen. (Clebsch.)
Zeitschrift für mathematik und physik. (Schlömilch.)
Zeitschrift für krystallographie und mineralogie.
Zeitschrift für allgemeine sprachswissenschaft.
Zeitschrift für neu-französische sprache.
Zeitschrift für keilschriftforschung.
Zoologischer anzeiger.
Marburg. Jahresbericht u. d. fortschr. d. chemie.
Munich. Königliche akademie der wissenschaften.
Strassburg. Zeitschrift für physiologische chemie.
Trieste. Κλείω.
Tübingen. Jahresbericht für reine chemie.
Vienna. K.-k. akademie der wissenschaften.
Ornithologische verein.
K.-k. geologische reichsanstalt.
Wiesbaden. Zeitschrift für analytische chemie. (Fresenius.)
Würzburg. Medicinische facultät.

FRANCE AND SWITZERLAND.

Cherbourg. Société nationale des sciences naturelles et mathématiques.
Paris. Institut de France: Académie des sciences.
Bureau des longitudes.

Paris. École normale superieure.
École polytechnique.
Observatoire de Paris.
Société chimique de Paris.
Société historique.
Société mathématique de France.
Annales de chimie et de physique.
L'astronomie.
Bulletin des sciences mathématiques et astronomiques.
Journal Asiatique.
Journal de mathématiques pures et appliquées.
Moniteur scientifique.
Nouvelles annales de mathématique.
Reforme sociale.
Revue de chefs d'œuvres.
Revue internationale de l'enseignement.
Revue linguistique.
Revue politique et littéraire.
Revue scientifique
Roscoff. Laboratoire de zoologie experimentelle.

Bern. Schweiz. gesellsch. für die gesammten naturwissenschaften.
Zurich. Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

Brussels. Académie des sciences de belgique.
Musée royal d'histoire naturelle.
Annales du bibliophile.
Athenaeum belge.
Ghent. Mathésis.
Archives de biologie.
Harlem. Musée Teyler.
Leyden. Nederlandsche dierkundige vereeniging.
Récueil des travaux chimiques des Pays-Bas.
Liége. Société royale des sciences.
Louvain. Le muséon.

ITALY; SPAIN; PORTUGAL.

Milan. Istituto Lombardo di scienze e lettere.
Annali di matematica pura ed applicata.
Naples. Giornale di mathematiche.
Zoologische station zu Neapel.
Palermo. Gazzetta chimica Italiana.
Rome. Reale accademia dei lincei.
Comitato geologico d'Italia.
Turin. Reale accademia delle scienze.
Archives Italiennes de biologie.
Rivista di chimica medica.
Venice. Reale istituto Veneto.
Coimbra. Jornal de sciencias mathematicas e astronomicas.
Lisbon. Academia real das sciencias.
Madrid. Novedades cientificas.

GREAT BRITAIN AND IRELAND.

Cambridge. Philosophical society.
Philological society.
Dublin. Royal Irish academy.
Trinity college.

Edinburgh. Royal society.
London. Royal society.
Royal astronomical society.
Royal microscopical society.
Royal institution of Great Britain.
Chemical society.
Mathematical society.
Mineralogical society.
Science and art department, South Kensington.
Society of biblical archaeology.
Society of telegraph engineers.
Society of chemical industry.
Antiquarian magazine.
Brain.
Chemical news.
Journal of conchology.
Journal of education.
Palestine exploration fund.
Scientific roll.

Denmark, Sweden and Norway; Russia and Finland.

Bergen. Museum.
Copenhagen. Royal academy.
Tidsskrift for mathematik.
Christiania. Archiv for mathematik og naturvidenskab.
University of Christiania, publications.
Norwegische commission der gradmessung.
Stockholm. Acta mathematica.

St. Petersburg. Académie impériale des sciences.
Russian chemical society.
Helsingfors. Société des sciences de la Finlande.

British India.

Calcutta. Asiatic society of Bengal.

Syria.

Beyrout. Muktataf.

Japan.

Tokio. University, publications of scientific department.
Seismological society of Japan.

Australia and New Zealand.

Sydney. Royal society of New South Wales.
Adelaide. Royal society of South Australia.
Wellington. Colonial Museum.
New Zealand Institute.
Geological Survey.

Mexico.

Mexico. Revista cientifica Mexicana.
Observatorio.

South America.

Rio de Janeiro. Observatoire impériale.
Quito. Anales de la universidad.

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This Report covers the Academic year ending September 1, 1883. The Appendix contains some statements of a more recent date.

ISSUED February 16, 1884.

NINTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY.

Baltimore, Maryland

1884

ACADEMIC STAFF, 1884-85.

Daniel C. Gilman, LL. D., ... *President of the University.*
J. J. Sylvester, F. R. S., D. C. L., . . *Professor (Emeritus) of Mathematics.*
Basil L. Gildersleeve, Ph. D., LL. D., ... *Professor of Greek.*
G. Stanley Hall, Ph. D., . . *Professor of Psychology and Pedagogics.*
Paul Haupt, Ph. D., ... *Professor of the Shemitic Languages.*
H. Newell Martin, Dr. Sc., A. M., . . . *Professor of Biology.*
Charles D. Morris, A. M., . . *Collegiate Professor of Latin and Greek.*
Simon Newcomb, Ph. D., LL. D., . *Professor of Mathematics and Astronomy.*
Ira Remsen, M. D., Ph. D., ... *Professor of Chemistry.*
Henry A. Rowland, Ph. D., ... *Professor of Physics.*
William H. Welch, M. D., ... *Professor of Pathology.*
John S. Billings, M. D., ... *Lecturer on Hygiene.*
Hiram Corson, A. M., LL. D.,* (Cornell Univ.) *Lecturer on English Literature.*
Edmund Gosse,* (Univ. Camb.) . . *Lecturer on English Literature.*
George S. Morris, A. M., Ph. D., . *Lecturer on the History of Philosophy.*
Léonce Rabillon, Bach. ès Lett., . . *Lecturer on French Literature.*
Sir William Thomson, LL.D.,*(Univ. Glasg.) *Lecturer on Molecular Dynamics.*
Herbert B. Adams, Ph. D., . . . *Associate Professor of History.*
Maurice Bloomfield, Ph. D., . . . *Associate Professor of Sanskrit.*
William K. Brooks, Ph. D., . . . *Associate Professor of Morphology.*
Thomas Craig, Ph. D., . . *Associate Professor of Applied Mathematics.*
A. Marshall Elliott, A. M., . *Associate Professor of the Romance Languages.*
J. Rendel Harris, A. M., *Assoc. Prof. of New Test. Greek and Palaeography.*
Harmon N. Morse, Ph. D., . . . *Associate Professor of Chemistry.*
William E. Story, Ph. D., . . . *Associate Professor of Mathematics.*
Minton Warren, Ph. D., ... *Associate Professor of Latin.*
William Hand Browne, M. D., . *Librarian and Associate in English.*
Charles F. Raddatz, ... *Examiner in German.*
William T. Councilman, M. D., ... *Associate in Pathology.*
Richard T. Ely, Ph. D., ... *Associate in Political Economy.*
Fabian Franklin, Ph. D., ... *Associate in Mathematics.*
Edward M. Hartwell, M. D., Ph. D., . . *Associate in Physical Training.*
J. Franklin Jameson, Ph. D., ... *Associate in History.*
Arthur L. Kimball, Ph. D., ... *Associate in Physics.*
Philip R. Uhler, ... *Associate in Natural History.*
George H. Williams, Ph. D., ... *Associate in Mineralogy.*
Henry Wood, Ph. D., ... *Associate in German.*
George Hempl, A. B., ... *Instructor in German.*
Hugh Newell, ... *Instructor in Drawing.*
Edward H. Spieker, Ph. D., . . *Instructor in Latin and Greek.*
Henry A. Todd, A. B., ... *Instructor in Romance Languages.*
Charles L. Woodworth, Jr., ... *Instructor in Elocution.*
William H. Howell, Ph. D., ... *Assistant in Biology.*
Edward H. Keiser, Ph. D., ... *Assistant in Chemistry.*
Charles A. Perkins, Ph. D., ... *Assistant in Physics.*
Otto Lugger, ... *Curator of the Biological Museum.*

*For the current year.

NINTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore, Maryland

1884

BALTIMORE
PRINTED BY JOHN MURPHY & CO.
182 BALTIMORE STREET
1884

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1883-84.

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1883-84.

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NINTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University:

I have the honor of submitting to you, and through you to the public, the ninth annual report of the Johns Hopkins University, for the academic year which closed on the first of September, 1884, the eighth year of instruction.

From the detailed statements which will be given on the subsequent pages, it will be obvious to all who are watching the growth of this foundation that the range of instruction is constantly widening, that the facilities for study are increasing, and that the opportunities here provided are appreciated by a company of enthusiastic students which constantly grows larger.

The various publications which are encouraged by appropriations from the funds of the university have appeared as promised, without any important changes in their plans. The "Circulars" have been made more than ever the repository of important abstracts, notes and brief communications furnished by the principal teachers and their advanced scholars.

NUMERICAL STATEMENTS.

The academic staff included during the year forty-nine teachers, six of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and forty-nine, of whom one hundred and twenty-three were residents of Maryland, and one hundred and eleven came here from twenty-nine other States of the Union, and fifteen from foreign countries. Among the students were one hundred and fifty-nine already graduated, coming from seventy-six colleges and universities; there were fifty-three matriculates (or candidates for the degree of Bachelor of Arts); and there were thirty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged one hundred and twenty-two.

Twenty-three young men have been admitted to the degree of Bachelor of Arts, and fifteen have been promoted to that of Doctor of Philosophy—making in all thirty-eight graduates. Since degrees were first conferred, in 1878, seventy-nine persons have attained the Baccalaureate degree, and fifty-four have been promoted to the degree of Doctor of Philosophy.

The following table indicates the enrollment of students in each year since the university was opened in the autumn of 1876:

	Graduates, (incl. Fellows.)	Matriculates.	Non-Matriculates.	Total Enrolled.	Average attendance at Public Lectures.
1876–77	54	12	23	89	60
1877–78	58	24	22	104	84
1878–79	63	25	35	123	96
1879–80	79	32	48	159	113
1880–81	102	37	37	176	186
1881–82	99	45	31	175	137
1882–83	125	49	30	204	148
1883–84	159	53	37	249	122

The attendance upon some of the principal courses during the last six years has been as follows:

	1878–79.	1879–80.	1880–81.	1881–82.	1882–83.	1883–84.
Mathematics,	38	31	31	33	35	37
Physics,	32	38	35	42	50	56
Chemistry,	39	46	40	44	49	51
Biology,	26	32	25	32	30	47
Greek,	40	36	31	33	44	41
Latin,	27	40	40	39	41	48
Sanskrit,	*	*	*	6	8	10
Shemitic Languages,	*	*	*	*	*	13
German,	55	60	55	47	50	63
French, Italian, etc.,	18	39	33	26	31	31
English,	*	19	29	22	45	50
History and Political Science,	19	33	40	40	64	88
Logic,	6	16	13	9	14	17
Philosophy, Ethics, etc.,	6	12	14	22	47	28

* Not recorded.

During eight years, six hundred and forty-eight individuals have been here enrolled as students, of whom three hundred and twenty-nine have come from Maryland, (including two hundred and sixty-three from Baltimore), and three hundred and nineteen from forty-two other states and countries. Of this number three hundred and ninety-five persons pursued courses as graduate students, and two hundred and fifty-three as collegiate students.

COMPLETION OF THE NEW LABORATORIES.

The new laboratories which were referred to in the last report, one for chemistry and one for biology, have proved entirely satisfactory to those who are most interested in their purposes. The chemical laboratory, as already stated, was formally opened in May, 1883; the biological laboratory was not completely ready for use until the autumn of the same year. On the second of January many members of the medical profession, the friends of the students, and others were invited to visit the building and to hear an address which was made by Dr. Martin on "Modern Physiological Laboratories; what they are and why they are."* Diagrams showing the plans of these two

* Printed in *Science*, for January 18, 25, 1884, and in the Johns Hopkins University Circulars, No. 29.

buildings and full descriptions, will be found on a later page.

By the transfer of the biologists to a separate edifice, ample space was provided for the present wants of students in history and political economy. Adjacent to a large room in which the Bluntschli library and other kindred books were placed, apartments were allotted to class instruction and to the studies of the professors. Other advantageous changes in the buildings have also been made. The university still needs a special building for its physical laboratory and this will probably be constructed at an early day.

A gymnasium has also been built and fitted up with a good selection from the Sargent apparatus. Bath-rooms and a ball-court are adjacent to the principal room. This addition to the attractions of the university life is greatly appreciated by the students, who have long been asking for some such means of recreation and physical training.

Changes in the Academic Staff.

At the beginning of the session, Professor Sylvester, who had been connected with the university since its opening in 1876, expressed a desire to be released from further service. Accordingly, in December, 1883, his connection with this institution was formally closed,—though his name will

henceforward appear on our roll as Professor Emeritus,—and his services will hereafter be given to the University of Oxford, where he has received the appointment of Savilian professor of geometry. Resolutions of respect were adopted by the Trustees and by the Faculty on his departure; a social assembly was held in Hopkins Hall to wish him farewell; and a medal in gold was struck and presented to him by colleagues, pupils and friends, in commemoration of his seven years' residence in Baltimore. In leaving, he expressed great regard for his associates and scholars, and his appreciation of the opportunities which had been opened to him in the professorship of mathematics at the Johns Hopkins University.

In September last Dr. Paul Haupt, Professor in the University of Göttingen, came among us as Professor of the Shemitic languages, and at once began to give instruction in Hebrew and Arabic and the cognate languages, to a company of well-trained and enthusiastic students, more numerous than we had reason to expect. He had also a class in Assyrian and Sumero-Akkadian. The increasing importance of these studies, and the interest attaching to them from every point of view—biblical, historical, and philological—are more and more obvious. As these pages are preparing for the press an announcement is made that, at the cost of Miss Wolfe, of New York, and under the guidance

of Dr. W. H. Ward, of that city, an expedition will proceed, before winter, from this country to the valley of the Euphrates for the purpose of exploration.

Instruction in Logic, Psychology, Ethics, and the History of Philosophy, has hitherto been given by three lecturers—no one of whom was recognized as the head of the department, and no one of whom devoted himself exclusively to his work in this university. The objections to this arrangement were apparent to all who were interested in these subjects, and when the infelicity was distinctly brought to the attention of the Trustees by one of the lecturers, the decision was reached to appoint a professor in the group of philosophical subjects, and to allow the lectureships to terminate at the end of the period for which they had severally been arranged.

The next step of the Trustees was to make choice of Dr. G. Stanley Hall, late lecturer in Harvard and Williams Colleges, and also in this university, as Professor of Psychology and Pedagogics. He accepted the invitation, and will hereafter reside among us. Dr. Hall is a graduate of Williams College, who spent several years in study abroad, and has been an influential writer, lecturer, and investigator in the subjects to which he is devoted.

As the construction of the Johns Hopkins Hospital approaches completion, the university is devoting much thought to the organization of its Faculty of Medicine. A study of the problem, consultation with eminent physicians at home and abroad, and an examination of other institutions, led long ago to the conclusion that a Professorship of Pathology should be among the earliest to be instituted. Chemistry and Biology, including morphology, embryology, and physiology, were already taught in the philosophical faculty. Pathology and Therapeutics were the scientific chairs which seemed to be next called for, as their instructions would be likely to require experimental laboratories, distinct from the Hospital and from the other university working rooms. After much inquiry, at home and abroad, the Trustees made choice of Dr. William H. Welch, of New York, to be Professor of Pathology. He is a graduate of Yale College, and of the College of Physicians and Surgeons, New York, who pursued his studies abroad, and afterwards became Professor in the Bellevue Hospital Medical College of New York. In forming their opinion of his qualifications for this responsible post, the Trustees had the benefit of many counsellors in the medical profession, among whom it may be proper to name Professor Cohnheim, of Leipsic, with whom Dr. Welch had

been a student.* Dr. Welch will spend a considerable portion, if not all, of the next year, in Europe, where he will make such purchases and pursue such inquiries as will enable him to be most useful when he returns to Baltimore. As an Associate in this department, Dr. Welch recommended, and the Trustees concurred in, the appointment of Dr. William T. Councilman, of Baltimore, who has been for several years connected with our biological laboratory as a student, an investigator, and a lecturer.

Dr. C. S. Hastings, Associate Professor of Physics, has accepted an invitation to become Professor of Physics in the Sheffield Scientific School of Yale College. During his residence in Baltimore he has devoted much attention to a study of the telescope, and has worked out a mathematical theory of the lens, which promises to be of great value in the manufacture of object glasses. He has also made a lens in accordance with this theory, which has proved to be very satisfactory under all the tests to which it has been submitted, and which, if he had remained in Baltimore, it was our hope to secure for the use of this university. He has also given much attention to the study of the sun's corona, both before and subsequent to the observations

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*The sad intelligence has just been received of the death of Dr. Cohnheim, August 15, 1884, at the age of 45 years.

which he made on the Caroline Island, during the solar eclipse of May 6, 1883. He carries with him to his new position the good wishes of all his colleagues in Baltimore.*

The place made vacant by his withdrawal has been offered to Mr. A. L. Kimball, Ph. D., who received his first degree at Princeton in 1881, and has since been resident among us as a Fellow, and as an assistant to Professor Rowland in the investigation which he is making for the government with respect to the unit of electrical resistance.

The ability shown by Mr. J. Rendel Harris, (late a Fellow and Lecturer in Clare College, of the University of Cambridge), in the textual study of the New Testament, and other early Christian writings, and the acuteness which he has shown in palaeographic study, has led the university to encourage him in the prosecution of such inquiries, and to designate him Associate Professor of New Testament Greek and Palaeography. He returned to Europe last June, where he proposed to devote a considerable period of time to the study of ancient manuscripts and to consultation with those who are expert in reading them. He will resume

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*For an account of his theory of the lens, see the Johns Hopkins University Circulars No. 19; his report on the observations made in the expedition to the Caroline Island, has been submitted to the Government and will soon be printed.

his work among us early in the coming academic year.

There have been other minor changes in the staff, of which the most important are these: Mr. A. M. Elliott has been designated Associate Professor of the Romance Languages; Dr. Henry Wood has been transferred, by his own wish, from the chair of English to that of German. Mr. H. F. Reid has given up the post of assistant in Physics in order to go to Europe, and the place is filled by the appointment of Mr. C. A. Perkins, Ph. D. Dr. A. Emerson has been designated an assistant in Classical Archæology for the year 1884–5.

Public Lectures.

In the public lectures during the year special attention was given for a considerable period to the subject of archæology. The course began with a lecture from Dr. Charles Waldstein, of the University of Cambridge, England, whose subject was the Influence of Athletic Games on Greek Art. He was followed by Mr. J. T. Clarke, of Boston, who has conducted the researches of the Archæological Institute of America at Assos, in Asia Minor, and who added to a plea for archæology, an illustrated narrative of the expedition of which he had been in charge. Mr. W. J. Stillman, formerly United States Consul in Crete, lectured after-

wards on Pre-historic Research in the Classical Field, on the State of Research in Greece, and on the Relations of Art to Archæology. Dr. Alfred Emerson, a Fellow in Greek of this university, gave six lectures on Olympia, in which he discussed the results obtained by the German expedition under Professor E. Curtius in their relation to what is otherwise known of the history, the architecture, and the life of Olympia. The course was concluded with a lecture from Professor Gildersleeve on the Relations of Literary and Plastic Art.*

Under the influence of this impulse, a university Archæological Society was formed early in the year, which at the close was made the Baltimore branch of the Archæological Institute of America. Frequent meetings have been held, at which papers have been presented by the resident members, and addresses have been made by Major Powell, of the U. S. Geological Survey, Mr. Clarke, Mr. Stillman, and others. For a moderate consideration, the university has obtained from the family of the late Mr. Mendez Cohen, of Baltimore, the remarkable collection of Egyptian antiquities which he brought together many years ago, and this will become, it is hoped, the nucleus of a museum of archæology.

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*Reports of these lectures are given in the Johns Hopkins University Circulars, Nos. 29 and 32, iii, p. 62 and p. 132.

A company of persons interested in the study of Christian art, under the leadership of Dr. A. L. Frothingham, Jr., have met several times during the spring in the Peabody Institute, for the purpose of studying, by photographs and engravings and valuable monographs belonging to that library, Italian art prior to the sixteenth century.*

The visits to the United States, of Professor Bryce, of Oxford, and Professor von Holst, of Freiburg, gave the university opportunity to secure from them once more brief courses of lectures. Mr. Bryce, whose previous visit was in 1881, took for his theme, by request, the study of Roman Law, and Mr. von Holst, who had previously lectured in 1879, now discussed the relation of History and Politics. Dr. J. S. Billings, U. S. A., the medical adviser of the Hospital Trustees, delivered a course of lectures on Municipal Hygiene, with special reference to the condition of Baltimore. Some of his most important remarks were subsequently printed in the "Circulars."†

Lectures were also given by Professor G. S. Morris, whose special subject was the Ethics of Social Relations, by Professor G. Stanley Hall on Pedagogics, and by Dr. Josiah Royce, formerly

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* For a sketch of these meetings, see the Johns Hopkins University Circulars, No. 32, iii, p. 138.

† See Johns Hopkins University Circulars, No. 30, iii, p. 81.

one of our staff of Fellows, on the Religious Aspect of Philosophy. In literature, three courses of public lectures were given. Professor Corson, of Cornell University, took for his theme the Poetry and Drama of the Restoration Period. So many persons showed a desire to hear him that Hopkins Hall was quite inadequate for the audience. Under these circumstances, the Trustees of the Peabody Institute, to whom the university is indebted for many favors, consented to allow the course to be given as a Peabody Class Course in one of their large lecture rooms. Later in the year Dr. Henry Wood gave a course of lectures on English Literature in the period from 1500 to 1580. Mons. Rabillon has continued, as heretofore, to lecture weekly in the French language on subjects in French literature. Mr. J. Rendel Harris gave a course of public lectures on Textual Criticism, and after the publication of the "Teachings of the Apostles," made that interesting treatise the subject of three lectures which were attended by clergymen of all denominations. During the first part of the session Professor Trelease, of the University of Wisconsin, was engaged among us as a teacher of Botany, and he also gave four public lectures on the Fertilization of Flowers. The average attendance upon all these courses of lectures is less than it has been during any of the three years previous. The novelty is past, and the audience is now chiefly

made up of those who take a serious interest in the subjects brought forward. Many are discouraged from coming because of the inadequate ventilation of the hall in winter, when full. Nevertheless, the plan which we have followed here during the last eight years of inviting to Baltimore as university lecturers distinguished scholars in various departments of learning, and whose permanent services we could not hope to engage, is productive of great good. Members of our own Faculty have also the opportunity, which is certainly at times most desirable, of coming before general audiences. To many of the residents of Baltimore, the lectures in Hopkins Hall are a constant source of instruction and pleasure, and it is said that in a few instances the opportunity of hearing these lectures has determined the winter residence of families and individuals.

Courses of Instruction.

I now proceed to the indication of the systematic instruction which has been given during the year in each of the subjects represented among us. The statements which immediately follow are generally, though not always, given in the form received from the principal instructors.

Classes have been taught during the year in English, Anglo-Saxon, German, French, Italian,

Spanish, Latin, Greek, Sanskrit, Hebrew, Arabic, and Assyrian; in various branches of Mathematics, including algebra of multiple quantity—invariants, non-Euclidean geometry, mathematical astronomy, higher plane curves, and conic sections—theoretical dynamics, elliptic functions, theory of functions, partial differential equations, theory of elasticity, and spherical harmonics—determinants, total differential equations, solid analytic geometry, the calculus and probabilities;—in Physics, including thermodynamics, heat conduction, physical optics, mechanics, mathematical theory of sound, theory of elasticity, mathematical astronomy, and general physics;—in Chemistry, mineralogy, geology;—in Biology, including animal and vegetable physiology and morphology;—in ancient and modern History, political economy, and international law;—and in logic, ethics, psychology, the history of philosophy, and pedagogics.

REPORTS ON THE STUDIES OF THE YEAR.

MATHEMATICS.

The following courses of lectures, etc., have been given during the year.

Professor Sylvester:

Algebra of Multiple Quantity. *Twice weekly, till the Christmas recess.*

Dr. Story:

Theory of Invariants. *Three times weekly, first half-year.*

Non-Euclidean Geometry. *Twice weekly, second half-year.*

Mathematical Astronomy. *Three times weekly, first half-year; twice weekly, second half-year.*

Higher Plane Curves. *Twice weekly, through the year.*

Conic Sections. *Twice weekly, through the year.*

Dr. Craig:

Theoretical Dynamics. *Twice weekly, first half-year.*
Mathematical Theory of Sound. *Three times weekly, first half-year.*
Elliptic Functions. *Three times weekly, first half-year.*
Theory of Functions. *Three times weekly, second half-year.*
Partial Differential Equations. *Twice weekly, second half-year.*
Theory of Elasticity. *Twice weekly, second half-year.*
Spherical Harmonics and Lamé's Functions. *Three times weekly, second half-year.*

Dr. Franklin:

Mechanics. *Three times weekly, through the year.*
Total Differential Equations. *Twice weekly, through the year.*
Determinants and Theory of Equations. *Three times weekly, first half-year.*
Solid Analytic Geometry. *Three times weekly, second half-year.*
Differential and Integral Calculus. *Three times weekly, through the year.*

Mr. C. S. Peirce:

Probabilities. *Twice weekly, second half-year.*

Physics.

The rooms devoted to the Physical Laboratory have been open daily for the prosecution of advanced study and research, under the direction of Professor Rowland and Dr. Hastings.

Lectures have been given by Professor Rowland on Thermodynamics, Heat Conduction, and Physical Optics, four times weekly through the year.

The work of a part of the students has been guided by Dr. Hastings. The major course has included lectures, weekly through the year, and daily work in the laboratory, especially on Wednesdays. The minor course in General Physics has included instruction daily through the year in Elementary Mechanics, Acoustics, Heat, Magnetism, Electricity, and Light, and a weekly exercise in the laboratory under Dr. Hastings and Mr. Reid.

During the year original investigations in the following subjects have been carried on:

On the photography of the spectrum by the concave grating.
On the variation of the magnetic permeability with change of temperature.
On the distribution of heat in the solar spectrum.
On the determination of the B.A unit of electrical resistance in absolute measure.
On the determination of the specific resistance of mercury.

Experiments have been carried on, under the direction of Professor Rowland, by aid of an appropriation from the government of the United States, to assist in establishing an international unit of electrical resistance.

Advanced students have also taken part in weekly meetings, for the reading and discussion of the current physical journals.

CHEMISTRY.

Advanced students have been engaged daily in the laboratory in prosecuting such work as seemed best adapted to the purposes of each. Those who have completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems.

The following investigations have been completed during the year. Others are in progress.

A contribution to the history of active oxygen.

The action of heat on ethylene.

On the chemical conduct of the sulphinide obtained by oxidizing *a*-naphthalene-sulphamide.

The effect of light on fermentation.

The relative stability of halogen derivatives of carbon compounds.

The results of these investigations have either been already published or will soon appear in the *American Chemical Journal*. Some of them have been read before the Johns Hopkins Scientific Association at its regular meetings.

The Fellows and other advanced students have met the instructors twice a week during the year for the purpose of keeping abreast of the current chemical literature. All the important journals have been carefully read, and full reports of the various articles have been made.

These students have been often called upon to treat important chemical questions in a broad way, going to the original sources and presenting the results in a complete form. In most cases the topics so investigated have been connected with the experimental work going on at the time; but other questions also have been elaborated in this way which bore less directly on the

current studies. In several cases carefully written reports of the results obtained have been prepared. The excellent library of chemical books and journals which is accessible to the students in the laboratory, at all reasonable hours, has greatly facilitated the execution of this very desirable literary work.

At the beginning of the year subjects were assigned to the Fellows and others for the preparation of lectures on various chemical topics treated historically; and sixteen such lectures were the result. These were prepared from a careful study of the original articles in the journals, and were not borrowed from books on the history of chemistry. Full abstracts of these lectures, furnished with complete references to the articles consulted, are to be prepared and preserved in the chemical library. The lectures given were as follows:

Two by Mr. D. T. Day on "The History of the Halogens";
Two by Mr. H. N. Stokes on "The History of Oxygen";
Two by Mr. E. H. Keiser on "The Chemistry of Iron Historically Considered";
Two by Dr. J. R. Duggan on "The History of the Azo- and Diazo-Compounds";
One by Dr. G. H. Williams on "The Relation between Crystalline Form and Chemical Constitution";
One by Mr. A. G. Palmer on "The History of Benzene";
One by Mr. H. W. Hillyer on "Stas's Work on Atomic Weights";
One by Mr. J. E. Talmage on "The History of the Alkali Metals";
Two by Dr. Morse on "The History of Phosphorus";
Two by Professor Remsen on "The Basicity of Acids."

In addition, the work of the year has consisted of the courses below mentioned:

Laboratory Work for undergraduates through the entire year, conducted by Professor Remsen and Dr. Morse.
Lectures by Professor Remsen:
General Chemistry (Non-Metals), *five times weekly, first half-year.*
Chemistry of the Compounds of Carbon, *five times weekly, second half-year.*
Courses by Dr. Morse:
Analytical Chemistry, *four times weekly, first half-year.*
General Chemistry (Non-Metals), *five times weekly, second half-year.*
Courses by Dr. Williams:
Practical exercises in Mineralogy and Petrography, through the entire year.
Mineralogy, *three times weekly, first half-year.*
Geology, *three times weekly, second half-year.*

BIOLOGY.

The Biological Laboratory has been open for eight hours daily during the year, for the prosecution of advanced study and research and for courses of practical instruction in connection with classes.

During the year original investigations, the results of which either have been or soon will be published, have been made in the following subjects:

The nature of the process of the coagulation of blood. The chemical composition of the blood of the Terrapin. The influence of various salts and other substances on the contraction of the arterioles. The suction-pump action of the heart. The influence of sudden variations of arterial pressure on the rhythm of the heart. The action of carbolic acid on the heart and its antagonism by atropin. The influence of convallarin and convallamarin on the heart. The anatomy of Nemertians. The development and metamorphosis of various insects. The development and histology of Salpa. The histology of Amiurus.

In connection with the regular class instruction, first year students thoroughly studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring there were a few practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The stock of physiological apparatus belonging to the University being unusually large, and including several duplicates of all the more frequently used instruments, each student in the class of Animal Physiology had the opportunity and was required to perform for himself all the really fundamental physiological experiments, save such as required some special skill or the use of very delicate apparatus; these were demonstrated to the class. The cat was also thoroughly dissected by the second year students.

A course of twenty-three advanced lectures was given as follows:

Four by Professor Martin on "The Causes of Chemical Degradation in the Animal Body."

Four by Mr. W. H. Howell on "The Consumption of Matter by the Animal Body under various conditions."

Two by Mr. F. S. Lee on "The Formation of Fat in the Animal Body."

Four by Mr. L. T. Stevens on "The Relative Value of Various Foodstuffs."

One by Mr. H. F. Nachtrieb on "The Physiology of Hunger and Thirst."
Three by Mr. Otto Lugger on "The Metamorphosis of Insects."
Two by Mr. H. L. Osborn on "The Embryology of Insects."
Three by Mr. H. W. Conn on "The Relationship between Vertebrates and Invertebrates."

Dr. W. K. Brooks gave a course of about thirty-five lectures on the Morphology of the Crustacea.

Professor W. Trelease, of the University of Wisconsin, delivered in January fourteen lectures on "Vegetable Physiology." He also delivered in Hopkins Hall four lectures on "The Fertilization of Flowers."

Most of the advanced work, however, was carried on individually, and not in class; each worker taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions.

Students engaged in this kind of study (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and criticise, if necessary) the experiments and results described in it. By studying and repeating the original work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this work, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows:

Osteology, *twice weekly, through the year.*
Mammalian Anatomy, *twice weekly, until Christmas.*
Animal Physiology and Histology, *three times weekly, through the year.*
General Biology, *three times weekly, until the middle of April.*
Embryology of the Chick, *three times weekly, from the middle of April until the close of the session.*
Plant Analysis, *twice weekly, in May.*

The seaside Zoölogical Laboratory for the study of forms of marine life has been open during the season of 1884 at Beaufort, N. C., under the direction of Dr. Brooks and Dr. Conn.

Researches were carried on at the Marine Laboratory upon the following subjects, among others:

The development of Thalassema. The anatomy and development of Echinoderms and Nemertians. The anatomy and development of Balanoglossus. The embryology and anatomy of Limulus, and of Gasteropods. The origin and significance of larval forms. The systematic zoölogy, anatomy and embryology of Hydroids. The histology of the eggs of Teleosts. The physiological influence of digitaline and other poisons. The zoölogy and metamorphosis of Crabs.

Articles by various members of the biological department have also been published in the *University Circulars*, *Studies from the Biological Laboratory*, in the *Journal of Physiology*, and in the *Zoölogischer Anzeiger*. Abstracts of two researches have been printed in the Proceedings of the Royal Society of London, and will appear in full in the "Philosophical Transactions."

The report of the Oyster Commission of the State of Maryland, prepared by Dr. W. K. Brooks, Chairman of the Commission, and embodying the results of his prolonged investigations at the Marine Laboratory upon the propagation of the American Oyster, was issued in February.

ANCIENT AND MODERN LANGUAGES.

Greek.

Under the direction of Professor Gildersleeve the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary the work of each year is concentrated on some leading author or some special department of literature. During the past year the work has been in the Greek historians.

In the seminary proper, which met twice a week during the academic year, select portions of Thukydides were interpreted in turn by the different members of the seminary, with lectures and illustrative papers by the Director and the students.

Among the subjects treated may be mentioned: The composition of the different parts of the history of Thukydides, the principles that regulate the introduction of the Thukydidean speeches, use of the passive and middle in Thukydides, Thukydidean compounds, use of *θέρος* and *χειμών* in Thukydides, oracles in Herodotos, conditional sentences in Herodotos, the tract de Republica Atheniensium.

The work of the seminary was supplemented by the lectures of the Director on Greek Historiography, illustrated by readings and by an analysis of the treatises of Dionysios of Halikarnassos on the style of Thukydides.

Besides the seminary course proper, Professor Gildersleeve delivered twenty-five lectures on the Theory of the Cases, conducted twenty-two exercises in translating at dictation from Greek into English, and English into Greek, and gave a course of fifteen lectures on Lucian.

Mr. Harris conducted a class-course in New Testament Greek, twice weekly, through the year, and gave two courses, one, of six lectures, on some New Methods of Textual Criticism, and the other, of three lectures on the newly published tract entitled "The Teachings of the Apostles."

Dr. Emerson conducted two classes in Pausanias and Greek Inscriptions, each meeting weekly during the second half-year, and a class in Greek Classical Antiquities, meeting twice weekly during the first half-year.

A public course on Classical Archæology, comprising fifteen lectures, was given during the year. The course began with a lecture by Dr. Charles Waldstein, four lectures were given by Mr. J. T. Clarke, three by Mr. W. J. Stillman, six by Dr. A. Emerson, and a closing lecture by Professor Gildersleeve.

Additional courses were conducted during the year, by:

Professor C. D. Morris, in

Thukydides, bk. VII, *four times weekly, first half-year.*

Sophokles, *Philoctetes;* Aristophanes, *Ranae, four times weekly, second half-year.*

(This class has also read at sight the Apology and Crito of Plato and about one-half of the Antigone of Sophokles).

Homer, *Iliad, once weekly, through the year.*

Dr. Spieker, in

Lysias, *four times weekly, first half-year.*

Homer, *Odyssey,* IX–XII; Euripides, *Alcestis, four times weekly, second half-year.*

Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Aeschylus, *Persae* (4).

Aristophanes, *Plutus* (1).

Demosthenes, *in Timocratem* (6).
Euripides, *Hippolytus* (4).
Herodotus, (Merry's Selections) (7).
Sophocles, *Electra* (1).
Xenophon, *Hellenica*, I, II, (7).

Latin.

The Latin Seminary under the direction of Dr. Warren, held two sessions a week throughout the year, the author selected for special study being Terence.

The plays of Terence were analyzed by the members of the seminary in turn, and a part of the Phormio and a very considerable portion of the Andria were made the subject of critical interpretation. Some twenty-five lectures were given by Dr. Warren on topics connected with the Roman drama, special attention being paid to the pre-Terentian literature, to the metres, and to the history of the text of Terence. Papers were presented embodying the results of special investigation by members of the seminary on the following subjects: on the Didascaliae, on the peculiarities of G. Sulpicius Apollinaris as shown in the Periochae, on the position of adjectives and possessive pronouns relative to their substantives, on the critical value to be assigned to the citations of Terence found in Nonius Marcellus, on some striking differences between the metres of Plautus and Terence and those of Greek Comedy, on Terence's use of substantives as compared with that of Plautus, on the relative value of the different MSS. of Terence and their characteristic peculiarities, on Terence's use of the present participle, on the cases of ἀρχαϊσμός specially remarked upon by Donatus.

Dr. Warren also gave in the first half-year, a course of lectures on Latin Palæography, accompanied by practical exercises in reading fac-similes of manuscripts. In the latter half of the year, a similar course was given on Latin Epigraphy.

Additional courses have been conducted during the year, by:

Dr. Warren, in

Select Letters of Cicero and Pliny, Aulus Gellius, *three times weekly, first half-year.*
Juvenal, Select Satires, *three times weekly, second half-year.*
Horace, Select Satires, *once weekly, second half-year.*
Reading at Sight.

Professor C. D. Morris, in

Lucretius and Plautus, *seven hours in two weeks, first half-year.*
Tacitus, *four times weekly, second half-year.*
Reading at Sight.

Dr. Spieker, in

Livy, *four times weekly, first half-year.*

Horace, *three times weekly, second half-year.*

(Classes in Latin Prose Composition were also conducted by each of the instructors in connection with the courses above named).

Dr. Emerson, in

Classical Antiquities, *twice weekly, second half-year.*

Students have privately read for examination the following books.

Cicero, *de Senectute* (7); *de Amicitia* (7); *pro Roscio Amerino* (6); *de Finibus*, I, (4); *ad Atticum* (1); *de Natura Deorum*, I, (4); *Philippica*, II, (1).

Horace, *Epodes, Carmen Saeculare*, (6).

Livy, XXII, XXIII, (1).

Lucretius, V, (1).

Martial, (1).

Ovid, *Fasti*, I, II, (6).

Seneca, *de Tranquillitate Animi, Apocolocyntosis*, (1).

Suetonius, *Tiberius*, (2).

Tacitus, *Dialogus, Annals* III, (2).

Terence, *Andria*, (4).

Vergil, *Aeneid*, V, VI, (1).

Shemitic Languages.

The centre of Professor Haupt's work was the Old Testament. Hebrew was read two hours weekly, and was constantly referred to in all the other lectures on Arabic, Ethiopic, Assyrian, Sumero-Akkadian, and in the Assyriological exercises. With the exception of the last, all the courses were intended for beginners. Accordingly the instruction was given not in lectures but after the seminary method.

In *Hebrew*, the elementary difficulties having been overcome, portions of the Pentateuch were read and afterwards, at sight, some chapters from the books of Judges, Ruth, and Kings. The interpretation was confined chiefly to a thorough philological analysis. As a number of students who had studied Hebrew for several years took part in this elementary course, exegetical and critical problems were incidentally discussed, but attention was devoted mainly to a thorough training in the forms of the language. The grammar used was Dr. Mitchell's translation of Gesenius-Kautzsch.

The *Arabic* class, for want of a suitable text book in English, had to use Petermann's *Brevis linguae Arabicae grammatica*. After a preparatory training in the sounds and forms, the first chapters of Genesis (Saadia's Arabic

version) were read and then the opening sura of the Qor'ân and an easy historical text without vowels. In the grammatical analysis the *forms* and the most important syntactical phenomena were thoroughly explained with a constant reference to the points of contact as well as of difference with the Hebrew language. In order to make the students acquainted with the use of the national Arabic lexica, Arabic definitions, chiefly from the Qamûs, were given and these served at the same time as exercises in reading at sight unpointed sentences. There were also composed by the students written exercises, conjugations of the more difficult irregular verbs and translations of syntactically interesting sentences from English into Arabic.

In *Ethiopic*, after some introductory lectures on the history of Abyssinia and the position of the Geez language in the cycle of the cognate idioms, the outlines of the grammar were given, and afterwards the reading and analysis of the *Narratiunculae de viris sanctis* in Dillmann's *Chrestomathia Aethiopica* were entered upon. The legends of St. Mark, Melchizedek, Abbâ Salâmâ, and Yared were read, and the beginning of the story of Macarius. In the grammatical interpretation the gutturals were especially treated of, with occasional references to Amharic and Tigriña and the close connection of the Geez language with Assyro-Babylonian was pointed out.

In *Assyrian* as well as in Ethiopic the lack of a convenient text book necessitated the dictating of the grammar. Thereupon the cuneiform Annals of Sardanapalus in Vol. V of Sir Henry Rawlinson's *Western Asia Inscriptions* were read: the account of the first five campaigns, the two against Egypt, the third against Baal of Tyre, the fourth against Achsheri (cf. Ahishahar 1 Chron. 7, 10) of Van, the fifth against Elam, and the beginning of the sixth against Shamash-shum-ukîn. Some written exercises with cuneiform paradigms of the Assyrian verbal inflexion, &c., were also composed.

In *Sumero-Akkadian* the great three-columned Syllabary in Haupt's *Keilschrifttexte* (Leipzig, 1881) was explained. The principal phenomena of the phonology of the pre-Shemitic idiom were discussed, the origin of some Akkadian ideographs from the archaic Mesopotamian picture writing traced and Akkadian words which have passed into Shemitic idioms especially into the language of the Old Testament were pointed out.

In the *Assyriological Exercises* for more advanced cuneiformists the sixth tablet of the Babylonian Nimrod Epic in Haupt's new edition (Leipzig, 1884) was read, and before this, select bilingual exorcisms, incantations, prayers, hymns, and penitential psalms in parts II and III of Haupt's *Akkadian and Sumerian Texts* (Leipzig, 1881) and in Vol. IV of Sir Henry Rawlinson's *Cuneiform Inscriptions*, with special reference to Akkadian syntax and to the dialectical variations in the ancient Protochaldean idioms.

All the courses were two hours weekly, except Arabic and Ethiopic for each of which only a single hour weekly could be spared.

The proceedings of the *Shemitic Society* are given by the Recording Secretary, Dr. Arthur L. Frothingham Jr., in the April number of the *Circulars*.

Sanskrit, etc.

Five courses in Sanskrit and a course in Comparative Philology were conducted by Dr. Bloomfield:

1. A beginner's class in Sanskrit, throughout the year. The most essential elements of the grammar were acquired in as short a time as possible, and then the student was brought face to face with the language, learning its structure and laws, not in the abstract, but in its living body. Five books of the *Nala* were read and thoroughly analyzed. The aim was either to prepare for the more advanced study of Indian philology in this university, or for private study, which is too difficult without such an introduction.

2. The advanced class in Sanskrit read during the greater part of the year the drama *Çakuntala*. The main effort was directed towards the Prākrit, which was constantly analyzed and compared with the Sanskrit. Toward the end of the year the class read selections from the Brāmaṇa literature.

3. Introduction into the Rig-Veda, throughout the year. After a short course of lectures, select hymns of this Veda were read. The language was studied from the point of view of the classical language; constant reference was made to the critical helps such as the *padapāṭha, anukramaṇī* and the metres.

4. During the first half of the session the Kauçika-sutra was read from the manuscripts and with the aid of a MS. commentary.

5. A practical exercise in Sanskrit Prose writing was conducted from Christmas to the end of the year, on the basis of Bühler's *Elementarcursus des Sanskrit.*

6. A course in the general principles of Comparative Philology was carried on throughout the year. It was introduced by ten lectures on the leading questions of Indo-European comparative grammar, (phonetic law and analogy, bi-syllabic roots, agglutination, etc.). For the rest of the year Prof. Whitney's "Language and the Study of Language" was made the basis of instruction, but this was constantly supplemented by lectures, which aimed to carry the subjects treated in the book up to the present day.

German.

Advanced courses were conducted as follows:

Gothic. *Weekly, first half-year.* DR. DIPPOLD.

Middle High German. *Twice weekly.* DR. DIPPOLD.

Deutsche Stilübungen and Essays. *Monthly.* MR. RADDATZ.

History of German Literature, consisting of lectures in German. *On alternate Saturdays.* DR. DIPPOLD.

Lectures on The Beast Epic and Middle Low German were also given, weekly, during the first half-year, by DR. GERBER.

The undergraduate classes were conducted by Dr. Dippold, with Mr. Raddatz in charge of the classes in Prose Composition.

In the first year's course Goethe's Egmont, Schiller's Maria Stuart, and Selections from Erler's Deutsche Geschichte, and from Scientific Prose were read. The first section read further Lessing's Minna von Barnhelm; and the second, Schiller's Wallenstein.

In the second year's course Goethe's Hermann and Dorothea, Faust, selections from Wilhelm Meister, and Lessing's Nathan were read; with the addition of sight readings from Emilia Galotti.

There were weekly exercises in Prose Composition in both the first and second year's courses.

Dr. Lehmann conducted twice weekly a class in German Conversation, for undergraduates and advanced students, and the major course students met each month, during the second half-year, under the direction of Dr. Dippold, for the reading and discussion of essays on works read in the course.

Anglo-Saxon and English.

Advanced courses were conducted by Dr. Wood in:

Anglo-Saxon: Bēowulf; Cædmon's Genesis. *Twice weekly.*

Old Saxon: Hēliand. *Weekly, first half-year.*

The advanced students also met fortnightly, under the direction of Dr. Wood, for work in general English philology, reports and discussions. Three of the papers prepared during the year for these meetings, were subsequently read before the University Philological Association.

Additional classes, including the first and second year's courses for undergraduates, were conducted as follows:

Anglo-Saxon: Sweet's Reader; Cynewulf's Elene. *Twice weekly.* DR. WOOD.

Early English (1300-1400). *Twice weekly.* DR. WOOD.

Chaucer. *Weekly.* DR. WOOD.

Shakspeare: Hamlet. *Twice weekly, first half-year.* DR. BROWNE.

English Prose Writers. *Twice weekly, second half-year.* DR. BROWNE.

Elements of English Phonetics. *Weekly, first half-year.* DR. WOOD.

Grammatical and Rhetorical Exercises. *Weekly.* DR. WOOD.

History of the English Language. *Weekly, second half-year.* MR. TOLMAN.

Dr. Browne also conducted twice weekly a general introductory course (P. H. E.) in the History of English Literature, with readings. Essays have been written monthly, by each member of this class, and have been corrected and commented upon by the instructor.

Professor Corson gave twenty public lectures on the Poetry and Drama of the Restoration Period.

Four class lectures on English Literature at the end of the 15th and beginning of the 16th century, were given by Dr. Wood, who also gave eight public lectures on the literature of the period 1500–1580.

Mr. Woodworth met students daily for training in Vocal Culture.

Romance Languages.

Two advanced courses were conducted by Mr. Elliott during the year. For the first of these the work centred in the Anglo-Norman Dialect, for the second in a study of the earliest Old French Monuments. The following special subjects were treated:

Anglo-Norman:—Chardry's *Josaphaz* (XIII century) was taken up and studied in its phonetic relations to earlier works in this dialect, and to the Franco-Norman and the Isle-de-France types. *Weekly, first half-year.*

Old French Seminary:—The Oaths of Strasburg were examined, according to facsimiles of the original MS., in their historical and linguistic relations to the Capitularia Regum and their bearing especially on the earliest development of the Romance system of phonetics. *Weekly, second half-year.*

Low Latin:—An Introduction, through the Inscriptions and Joca Monachorum given in P. Meyer's *Recueil d'Anciens textes Bas-Latins, etc.* *Second half-year.*

Provençal:—The Boethius Hymn, the Girard de Rossillho Epic, with divers extracts, taken according to age, from the literature of the tenth, eleventh, and twelfth centuries. *Weekly, during the year.*

Old French as Introduction to French Philology:—*Aucassin et Nicolète* with special reference to its phonology and dialect character. *Weekly, first half-year.*

Portuguese:—Os Lusiadas de Camões was read, attention being given to Old Portuguese, Old Spanish and Latin forms. *Weekly, first half-year.*

Wallachian:—An Introduction was given in Cioneа's *Practische Grammatik der rumänischen sprache* together with extracts from Sionu, Alesandrescu and Alexandri. *Second half-year.*

Ladinian:—The Musso and Valtelline War Epics (XVI and XVII centuries) were read together with selections from the modern literature of Pallioppi, Caderas, Caratsch, and from the Folk Lore. *Weekly, through the year.*

Lectures:—(*a*) On Spanish and Portuguese Dialects, *weekly, through the year;* (*b*) On Comparative Romance Grammar, *weekly, through the*

year; (*c*) On French Phonetics, *thirty lectures;* (*d*) On Dante's Divina Commedia, *seven lectures;* (*e*) On the History of the Past Participle in French, *two lectures.*

The students of the French Major Course have read with Mr. Todd:

In Classical (XVII century) French, *Le Cid* (Corneille); *Athalie* (Racine), *L'Avare* (Molière);—In Middle (XVI century) French, the most important selections (considerably more than half) of Darmesteter and Hatzfeld's *Morceaux Choisis des Auteurs du XVI Siècle,* with a *précis* of Middle French Grammar, *twice weekly, first half-year;*—In Old French, the following selections from Bartsch's *Chrestomathie de l'ancien français: Serments de Strasbourg, Cantilène de Ste. Eulalie, La Passion, St. Léger, St. Alexis, Chanson de Roland, Amis et Amiles, Roman de la Rou, Contes del Graal, Roman de Renart, Roman de la Rose, Conqueste de Constantinople, Chroniques de Froissart, Mémoires de Philippe de Comines, Perceforest, twice weekly, second half-year;*—Composition; exercises in style with the use of Gasc's *Prose Composition.* In the second half-year these were supplemented by original essay writing.

The students of the French Minor Course have read with Mr. Todd:

In Literary French, *Le Roi s'amuse,* by Victor Hugo; *Les Demoiselles de St. Cyr* and *Halifax,* by Alexandre Dumas, *père; Le Gendre de M. Poirier,* by Emile Augier and Jules Sandeau; and a part of *La Chanson du Jardinier,* by André Theuriet, *twice weekly;*—In Historical French, one hundred pages of Voltaire's *Histoire du Siècle de Louis XIV, weekly;*—In Scientific French, eighty pages of Milne-Edwards' *Précis d'Histoire Naturelle, weekly.* In connection with the two latter courses the class has studied nearly all of Breymann's French Grammar;—In Syntax and Idioms the class has had recitations and written exercises on the whole of Part I and twenty-five *thèmes* of Part II of Chardenal's *Exercises for Advanced Pupils, weekly.*

Mr. Fontaine has met the students of the Minor Course five times weekly for French conversation, with systematic instruction and drill in the pronunciation.

Mr. Todd has conducted special courses in Spanish and Italian:

The class in Italian has read the following authors:—Silvio Pellico: *Francesca da Rimini* and sixty chapters of *Le Mie Prigioni;* Goldoni: *Un Curioso Accidente, Gl' Innamorati* and *La Sposa Sagace;* and a short *Storia della Letteratura Italiana.* They have further read short selections from Tommaseo, Mamiani, Manzoni, Botta, Leopardi, Alfieri, Tassoni, Tasso, Ariosto, Petrarch, Boccaccio, and others, *twice weekly.* Short exercises in grammar have been given weekly, in connection with the above readings. A special class in Dante has read Cantos V, XII–XXVI of the Inferno, *weekly.*

The class in Spanish has read the following:—Lope de Vega: *El Desdichado por la Honra;* Calderon: *El Alcalde de Zalamea;* and the whole of Knapp's *Spanish Readings, twice weekly.* Short exercises in grammar have been given weekly, in connection with the above.

Two public courses on French Literature including twenty-three lectures and readings (in French) were given by M. Rabillon. He also conducted classes in French conversation.

History and Political Science.

Seminary Work.

A. American Institutions and Economics.

The Seminary of Historical and Political Science has met regularly once a week for a session of two hours under the direction of Dr. H. B. Adams. During the past year, attention has been directed especially to the study of American Institutions and American Economics, with reference to specific topics suggested by the instructors in those departments of study.

Among the original papers presented and discussed by members of the Seminary are the following: The Seminary Method, by H. B. Adams; Christian Socialism, by R. T. Ely; Étienne Cabet and his Icarian Community, by Albert Shaw (Doctor's thesis, 1884); Virginia Institutions (three papers), by Edward Ingle; Judicial Procedure among Boys, by John Johnson; State and Local Taxation in Kentucky, by Arthur Yager (Doctor's thesis, 1884); Congressional Government, by Woodrow Wilson.

B. American Colonial History, by Dr. H. B. Adams.

An extra session of the Seminary, one hour a week through the year, has been devoted to the study of the sources of American Colonial History and to the prosecution of certain lines of research suggested by the instructor.

Attention was first called to the history of American discoveries and to early American cartography. The first settlements of Virginia, of New England, and of other colonies were then investigated. Papers were prepared by students upon such subjects as the following: the Spaniards in Florida, the Swedes on the Delaware, the Economic Beginnings of Pennsylvania, the Institutional History of Pennsylvania, the Beginnings of Connecticut, the Institutions of Virginia, Maryland, California and the Southwest, Oregon and the Northwest, etc. Some of this Seminary work will be elaborated into studies suitable for publication. Particular attention

was called by the instructor to the development of federal unity among the colonies. The phases of union before the Continental Congress were considered in detail, and some new lines of inquiry were pointed out.

Advanced and Collegiate Classes.

DR. H. B. ADAMS.

1. Historical Development of International Law.

An advanced course, three hours weekly, first half-year, introductory to the study of Bluntschli's *Völkerrecht* in the German text.

The instructor lectured upon the beginnings of international life as illustrated in ancient and mediæval history. He considered such topics as the inter-tribal and inter-municipal relations of the Orient; the inter-municipal institutions of the Greeks; the international influence of Rome and of the Christian Church; the Italian beginnings of modern international law; and the rise of the state system. In connection with this historical survey of the growth of internationalism, various special papers were presented by members of the class, upon such subjects as Carthaginian treaties, the Roman municipal system, the municipal leagues of the middle ages, etc. In connection with the reading and exposition of Bluntschli's code, a great variety of practical questions pertaining to international politics were discussed by individuals, *e. g.*, France in the Tonquin, the opening of China, the progress of Japan, the control of the Congo, international congresses and tribunals, the Panama Canal, the Monroe doctrine, etc.

2. The Old German Empire and the Rise of Prussia.

This was an advanced course, three hours a week, second half-year, after the conclusion of the course on International Law.

Lectures were given upon mediæval Germany, the origin and development of Prussia, its territorial and dynastic history, its relation to the break-up of mediæval unity and to the re-constitution of Germany. The course was designed to be introductory to the study of European Constitutions and Continental Politics, which subjects will be pursued during the next academic year. In connection with the lectures, oral examinations were instituted upon general topics of European history, which practical exercises will be continued during the coming year.

3. The Beginnings of Church and State.

An undergraduate course, twice a week, first half-year. The course consisted of lectures by the instructor and oral reports by members of the class, in which exercises ten graduate students participated. The instructor considered the origin and spread of Christianity, its

relations to the Roman empire and the Germanic peoples; the origin and growth of ecclesiastical institutions, — bishops, presbyters, synods, councils, etc.; the history of the papacy in the middle ages; and the Holy Roman Empire. The students prepared essays and reports upon topics connected with the course and were examined upon the lectures, together with certain prescribed authors, — Bryce, portions of Gibbon, Milman, and Ploetz's Epitome.

4. The Italian Renaissance.

A continuation of the above undergraduate course, two hours a week, second half-year. The course consisted chiefly of lectures upon the history of the Italian republics, the revival of learning and of art, and the relations of Italian to European history. Reading was required in such authors as Burckhardt, Symonds, Grimm, and Hallam; reports were prepared upon assigned topics.

5. Introductory Historical Course.

Twelve lectures to undergraduates entering upon the course in Physical Geography, History, and English.

DR. R. T. ELY.

6. Advanced Course in Political Economy.

This course, three hours weekly, throughout the year, consisted of class-lectures, student-lectures, and occasional special lectures.

The subjects to which particular attention was devoted were as follows: The Historical Development of Economic Theory; the Fundamental Principles of Political Economy, including definitions; Production; Value and Price; Distribution and Consumption; the means of Transportation and Communication; Free Trade and Protection; Social Movements in America. Each student read a paper on some phase of economic history and a number of essays were prepared on the History of Political Economy in the United States. A paper was also read on Taxation in Baltimore, and a careful study of Taxation in Pennsylvania has been begun. An essay on "Icaria, a chapter in the History of American Communism," was prepared and part of it read before the class. This essay by Dr. Albert Shaw is now in press and will be published in book-form by Messrs. G. P. Putnam's Sons.

7. Minor Course in Political Economy.

The first part of this course consisted of lectures on the Elements of Political Economy and a careful study of John Stuart Mill's Principles of Political Economy, with frequent reference to Walker's "Political Economy," and other works. The second part consisted of lectures on Historical Systems of Political Economy. At least two papers were prepared and read by each member of the class. A few of the subjects treated were as follows: The Wage-Fund Theory; Trades Unions and Strikes; The Internal Revenue of the

United States; the Income Tax; Communistic Experiments in the United States; The Independent Treasury System of the United States; the Theory of Value.

DR. J. F. JAMESON.

8. History of England and France.

This course, three hours weekly throughout the year, formed, with Dr. Adams's undergraduate work, the minor course in History. Green's England and Masson's Guizot's France were used as text-books. The recitations were accompanied by informal lectures. Reports upon topics, specially assigned, and studied under the direction of the instructor, were made. Additional reading in the standard authors was required. Formal lectures brought the course down to the present time.

9. History of Greece and Rome.

Twice weekly throughout the year. Text-books were used, informal and occasionally formal lectures were given, and selected topics were reported upon.

10. English Constitutional History.

Once a week. Stubbs' "Select Charters and other Documents illustrative of English Constitutional History" was used; the period studied was that from 1066 to 1216, special attention being paid to the development of the principles established by Magna Charta.

11. Physical Geography.

Lectures on the relations of Physical Geography to History (with special reference to Greece and Italy) were given once a week, beginning in January.

Courses of public lectures were also given in Hopkins Hall:—on the Relation of History and Politics, by Professor H. VON HOLST, of the University of Freiburg, and on the Study of Roman Legal History, by Professor JAMES BRYCE, of the University of Oxford.

PHILOSOPHICAL COURSES.

PROFESSOR G. STANLEY HALL lectured twice a week through the second half-year on Psycho-physics.

The course was mainly devoted to the physiology of the senses, cerebro-spinal localization and attention, as introductory to a course on psychology, beginning with instinct, during the coming year. Demonstration work was done and courses of reading posted.

Six advanced students engaged in special investigations in the room set apart for psycho-physic research and results were obtained that will be published later.

Dr. Hall lectured twice a week on psychological ethics, mainly historical, beginning with ethical conceptions and theories of the Greeks and concluding with Kant, and considerable attention was given to inductive methods of studying ethical problems.

He also gave twelve lectures to the matriculate students on Mental Hygiene.

PROFESSOR G. S. MORRIS gave during the first half-year:

1. A course of three lectures weekly on the History of Philosophy in Germany, with special reference to the movement from Kant to Hegel.

The beginnings and the general character of the history of modern philosophy were first briefly sketched; the doctrines of Descartes, Spinoza, and Leibnitz were described in greater detail; and then, after a summary account of the philosophical situation in Germany prior to Kant, the doctrines of Kant were analyzed, with special reference to the unity of the three *Critiques*, and to the comprehension of the fundamental problems of philosophy, as anew presented by Kant, (1) in the light of the results of ancient philosophy, and (2) with reference to the further treatment of these problems by the successors of Kant. This course was designed for advanced students.

2. A Seminary course, for the most advanced students only, was conducted, the subject of study being Spinoza's *Ethics*. The work in this course was restricted especially to the first, second, and fifth parts of Spinoza's masterpiece.

The object of the study was to attain an exact knowledge of the nature of Spinoza's fundamental conceptions and of his method, to estimate their value and significance in the light of the larger historic results of philosophic inquiry, and, in some measure, to consider their relation to the fundamental conceptions of modern science. In accordance with the Seminary method, the different members of the class by turns took the lead in the analytic exposition of the text and criticism of the argument.

3. An outline of the general History of Philosophy, both ancient and modern, was given in a series of two lectures weekly, throughout the first half-year.

This was intended for undergraduates and others desiring to take advantage of such a course. Members of the L. E. P. course were required to listen to and be examined on twelve lectures relating to modern philosophers.

4. A course of four public lectures on the Philosophy of Social Relations was also given by Professor Morris.

MR. C. S. PEIRCE gave a course of lectures in Mathematical Logic, twice weekly through the year; a course in Philosophical Terminology, weekly during the first half-year; and a course in Probabilities, twice weekly during the second half-year.

He also guided a company of students in studying the psychology of great men.

MR. HARRIS gave an elementary course in Logic during the first half-year and a course in Practical Ethics during the second half-year.

Two public lectures on the Religious Aspect of Philosophy were given by Dr. Josiah Royce, of Harvard College.

DRAWING.

Arrangements have been made by which MR. HUGH NEWELL devotes five afternoons in the week to instructing both undergraduate and graduate students in freehand drawing, in perspective, descriptive geometry, and other branches of mathematical drawing.

PHYSICAL TRAINING.

The department of Physical Training has been in charge of DR. E. M. HARTWELL.

The interest taken by all classes of the members of the University in the Gymnasium, which was opened for use December 15, 1883, has been noteworthy and encouraging. Although attendance at the Gymnasium has thus far been wholly voluntary, more than two-thirds of the members of the University enrolled during the past year have elected to undergo a physical examination by the Director of the Gymnasium, and to avail themselves of the privileges of the department under his counsel and direction. Henceforth all candidates for the degree of Bachelor of Arts will be required to take the course in Physical Training, which will include lectures and lessons in Elementary Physiology and Hygiene as well as a prescribed minimum amount of physical exercise; such exercise and its amount to be determined by the Director for each individual.

It is gratifying to note that good order and gentlemanly behavior have uniformly prevailed in and about the Gymnasium. The

Gymnasium certainly affords valuable means for the promotion of social intercourse and good fellowship amongst the students as well as for recreation and exercise.

A tennis court has been completed on the lot adjoining the Gymnasium. The Clifton playgrounds are now in good condition and will henceforth be available for the purposes of out door sports.

Graduates of the Year.

Twenty-three undergraduates have come forward to the baccalaureate degree during the year, namely:

Bachelors of Arts, 1883–84.

Albert Clayton Applegarth, Baltimore.
Charles Walter Artz, Hagerstown.
Walter Bliss Canfield, Baltimore.
George Gibson Carey, Jr., Baltimore.
Walter Kennedy Cromwell, Baltimore County.
Charles William R. Crum, Jefferson.
Harry Friedenwald, Baltimore.
William Lindsay Glenn, Baltimore.
John Hinkley, Baltimore.
Charles Howard Howard, Baltimore.
John Deering Lord, Jr., Baltimore.
Jere Williams Lord, Baltimore.
William Patrick Lyons, Baltimore.
Edgar George Miller, Jr., Baltimore.
William Ridgely Orndorff, Baltimore.
George Dobbin Penniman, Howard County.
William Henry Perkins, Baltimore.
George Clement Stokes, Jr., Govanstown.
William Jones Thomas, Baltimore.
William Ferdinand Walz, Baltimore.
Frederick Henry Wilkens, Baltimore.

Extra Ordinem.

George Wishart Edmond, Portland, Maine.
Charles Howard Shinn, San Francisco, California.

Fifteen candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy;—namely:

Doctors of Philosophy, 1883–84.

Herbert William Conn, of Fitchburg, Massachusetts, A. B., Boston University, 1881. His principal subject has been Animal Morphology, the

subsidiary, Animal Physiology and Histology. His thesis on the "Life-History of Thalassema Millita" has received one of the Walker prizes of the Boston Society of Natural History.

Ellery William Davis, of Oconomowoc, Wisconsin, S. B., University of Wisconsin, 1879. His principal subject has been Mathematics, the subordinate, Physics. He submitted a thesis on the "Parametric Representation of Curves."

David Talbott Day, of Baltimore, A. B., Johns Hopkins University, 1881. His principal subject has been Chemistry, the subordinate, Physics. He submitted a thesis on the "Changes effected by Heat in the constitution of Ethylene."

John Dewey, of Burlington, Vermont, A. B., University of Vermont, 1879. His principal study has been Philosophy, the subsidiary, Political Science. He submitted a thesis on the Psychology of Kant.

James Reynolds Duggan, of Macon, Georgia, A. B., Mercer University, 1877, and M. D., Jefferson Medical College, 1879. His principal subject has been Chemistry, the subordinate, Biology. He submitted a thesis on "Fermentation."

William Henry Howell, of Baltimore, A. B., Johns Hopkins University, 1881. His principal subject has been Animal Physiology and Histology, the subordinate, Chemistry. He submitted a thesis entitled "Experiments upon the Blood and Lymph of the Terrapin, and the origin of the Fibrin formed in Coagulation."

Hans Carl Günther von Jagemann, of Naumburg, Germany, a graduate of the Naumburg Gymnasium. His principal subject has been the Romance Languages, the subordinate, English and German. He submitted a thesis on the "Anglo-Norman Vowel System in its relations to the Norman words in English."

Edward Harrison Keiser, of Allentown, Pa., B. S., Swarthmore College, 1880. His principal study has been Chemistry, the subordinate, Physics. His thesis was on "The Existence of Active Oxygen."

Arthur Lalande Kimball, of Plainfield, N. J., A. B., Princeton College, 1881. His principal subject has been Physics, the subsidiary, Mathematics. He submitted a thesis on the "Value of the B. A. Unit of Electrical Resistance in Absolute Measure."

Henry Leslie Osborn, of Madison, N. J., A. B., Wesleyan University, 1878. His principal subject has been Animal Morphology, the subsidiary, Animal Physiology and Histology. His thesis on "The Gill in some forms of Prosobranchiate Mollusca" has already been printed in the Studies from the Biological Laboratory.

Charles Albert Perkins, of Ware, Mass., A. B., Williams College, 1879. His principal subject has been Physics, the subordinate, Chemistry. He submitted a thesis on the "Variation of the Magnetic Permeability of Nickel at different temperatures."

Albert Shaw, of Grinnell, Iowa, A. B., Iowa College, 1879. His principal study has been History, the subordinate, Political Science. His thesis

entitled "Étienne Cabet and the Icarian Community," has been published in book-form by G. P. Putnam's Sons, New York.

Henry Newlin Stokes, of Moorestown, N. J., S. B., Haverford College, 1878. His principal subject has been Chemistry, the subsidiary, Animal Physiology and Histology. His thesis was on "The Nature of the Sulphinide obtained by oxidizing α-Naphthalene-sulphamide."

Lewis Webb Wilhelm, of Baltimore, A. B., Johns Hopkins University, 1880. His principal subject has been History, the subordinate, Political Science. His thesis entitled "Sir George Calvert, Baron of Baltimore," has been published by the Maryland Historical Society.

Arthur Yager, of Georgetown, Ky., A. B., Georgetown College, 1879. His principal subject has been History, the subsidiary, Political Science. He submitted a thesis on "State and Local Taxation in Kentucky."

University Societies.

The several scientific associations, composed of members of the faculty and advanced students, have met regularly, as heretofore, for the presentation and discussion of original papers.

1. The Scientific Association, under the presidency of Professor Martin, has had eight meetings. Papers have been read by: —

W. K. Brooks, on the methods used in investigating the oyster beds of the Chesapeake Bay.
H. W. Conn, on the evidence of a protozoea stage in crab development.
W. T. Councilman, on a case of endocarditis in a dog.
D. T. Day, note on the action of heat on ethylene.
C. S. Dolley, on an infusorian recently observed in Baltimore water.
H. H. Donaldson, resumé of some recent work on the brain.
G. Stanley Hall, on compound reaction time.
C. S. Hastings, on the scientific results of the eclipse expedition.
W. H. Howell, on the coagulation of the blood.
H. Newell Martin, on symbiosis.
T. W. Mills, *notes from the Marine Laboratory.*
H. L. Osborn, on the molluscan gill.
H. F. Reid, note on auroras.
Ira Remsen, the evidence for the existence of a third form of oxygen; on the pyridene period; on the glucose industry of the United States.

H. A. Rowland, note on the solar spectrum; on the dynamic theory of diffraction.

W. E. Story, a notation for binary arithmetic and its use.

G. H. Williams, notes on a geological expedition on the Upper Saguenay; an account of the discovery by Dr. Hans Rensch, of fossils in the crystalline schists of the peninsula of Bergen, in Norway.

2. The Philological Association, under the presidency of Professor Gildersleeve, has had eight meetings. Papers have been read by: —

M. Bloomfield, on certain irregular Vedic subjunctives or imperatives; on a proposed edition of the Kāuçika-sūtra of the Arthava Veda; the probability of the existence of phonetic law.

M. W. Easton, *uniformity and analogy*.

A. E. Egge, on inchoative or *n*-verbs in Gothic and other Germanic dialects.

A. M. Elliott, the Nahuatl-Spanish dialect of Nicaragua; the development of verbal parasynthetics in *a* in the Romance Languages.

A. Emerson, a *communication from* Prof. E. Wölfflin on the formation of a new Thesaurus Linguæ Latinæ.

B. L. Gildersleeve, on Ribbeck's life of Ritschl; on the final sentence in Greek.

J. R. Harris, on the exemplar of codex C and the Apocalypse; notes on the Sinaitic and Vatican codices.

J. A. Harrison, the syntax of the old past participle and *avoir* in French poetry of the XIIth century.

P. Haupt, on the Babylonian "woman's language."

C. W. E. Miller, rhythmical pronunciation of Greek and Latin prose and a few remarks on accent.

C. D. Morris, the rights of a Greek metropolis over its colonies; on K. Brugmann's recent grammatical studies.

E. G. Sihler, studies in Dinarchus.

E. H. Spieker, note on a certain use of the Sanskrit word *yathā*.

A. S. Tolman, musical notation in the study of blank verse.

M. Warren, note on Plautus Mercator.

H. Wood, on T. L. Beddoes, a survival of style.

C. B. Wright, on parallelisms in Beówulf.

3. The Mathematical Society, under the presidency of Professor Sylvester, and later under that of Dr. Story, has had seven meetings. Papers have been read by: —

G. Bissing, on the degeneration of unicursal curves; a note on developable surfaces; unicursal curves in n-flat space; on curvature in n-flat space.

T. Craig, on a certain class of transcendental functions.

E. W. Davis, some remarks on unicursal curves.

W. P. Durfee, a note on the divisibility of numbers; on the number of substitutions of n lettters which leave k of them unaltered.

G. S. Ely, a note on partitions.

F. Franklin, *an elementary demonstration of Stirling's theorem*; two notes.

A. S. Hathaway, a demonstration of a theorem of Clebsch; the reduction of quadratic forms to sums of squares; on a form for the residues of composite moduli; a note on cycles.

C. S. Peirce, on the mode of representing negative quantity in the logic of relatives.

W. E. Story, on the intersection of linear and quadratic loci; a symbolical demonstration of Taylor's theorem; on a system of straight lines determined by two given lines; a note on ruled surfaces; on the equations which determine the directions of the axes of a quadric surface.

J. J. Sylvester, on the relation of minor determinants of products to minors of the factors.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, has held frequent meetings. Among the papers read were the following: —

H. B. Adams, on the seminary method.

James Bryce, a criticism of De Tocqueville.

Edward Channing, on town and county government in the United States.

Samuel Dike, on the divorce question in the United States.

N. H. Eggleston, on forestry in the United States.

R. T. Ely, on Christian socialism.

H. P. Goddard, Luther Martin, a biographical study.

Charles Gross, on the guild merchant, an introduction to English municipal history.

E. M. Haines, *on township organization in the west.*

James A. Harrison, on old Teutonic life in Beówulf.

H. von Holst, the study of slavery as an institution.

Edward Ingle, on the county institutions of Virginia; the Virginia parish.

Jesse Macy, on the genesis of civil government in Iowa.

E. D. Neill, records of the Virginia company, and notes on early Maryland history.

J. W. Powell, on Indian institutions.

Josiah Royce, on the development of society and government in California.
W. B. Scaife, on the study of Roman law and history.
Albert Shaw, Étienne Cabet and his Icarian community.
C. H. Shinn, a new labor problem in California; the origin of institutional government in Oregon.
Woodrow Wilson, on congressional government.
A. Yager, taxation in Kentucky.

5. The Metaphysical Club, under the guidance of Messrs. G. Stanley Hall, G. S. Morris, and C. S. Peirce, has had eight meetings. Communications were presented as follows: —

A. T. Bruce, on the design argument.
J. Dewey, on the psychology of consciousness; Delbouef on living and dead matter; the new psychology.
G. Stanley Hall, the nisus formitivus in sane and insane minds.
J. R. Harris, on the syllogism.
E. M. Hartwell, on the body as a spiritual residence.
J. Jastrow, a review of Galton's "inquiry into human faculty;" materialism, spiritualism, and the scientific spirit.
G. S. Morris, on the philosophical conception of life.
C. S. Peirce, on the logic of religious life.
L. F. Ward, on mind as a local factor.

6. The Society for Shemitic Philology. This association was organized during the year under the guidance of Professor Haupt. Papers have been read at the meetings as follows: —

C. Adler, the city of Harran and its place in ancient history; the differences of pronunciation of Hebrew among the Jews of different countries of Europe; on a Hebrew MS. of c. 1300.
W. M. Arnolt, on Shemitic loan-words in old Greek.
A. L. Frothingham, Harran and its condition after the Christian Era; on the history of Syriac literature from the beginning of the Christian Era to the thirteenth century.
J. R. Harris, an etymology of the name of S. Luke given by Isadore of Seville.
A. H. Huizinga, on the Massora and its critical and editorial treatment.
C. Lehmann, the people and language of the Medes; the exchange of *šin* and *non* in the proto-Babylonian language.

7. The Naturalists' Field Club, Dr. G. H. Williams, president.

This was organized by members of the University, but includes in its list of members other residents of Baltimore interested in Natural History. The club works in three sections—Geology and Mineralogy, Zoölogy, Botany. Each section elects its own officers and arranges for its own field excursions and its own meetings. There are also monthly meetings of the whole club, when the chairmen of the different sections report progress and an address on some topic of Natural History is given by one of the members.

The mineralogical collections of the club are preserved in the Chemical Laboratory; the botanical and zoölogical in the Museum of the Biological Laboratory.

8. During the year an Archæological Society has been organized. Several meetings have been held, at which reports and communications have been presented.

PUBLICATIONS.

1. Four numbers, making the sixth volume of the American Journal of Mathematics, have been issued during the year. Papers by members of the university have been contributed as follows: —

T. Craig, on quadruple theta functions; on certain groups of relations satisfied by the quadruple theta functions; on theta functions with complex characteristics.

A. L. Daniels, notes on Weierstrass' methods in the theory of elliptic functions.

G. S. Ely, the method of graphs applied to compound partitions.

F. Franklin, note on "the development of an algebraic fraction."

A. S. Hathaway, some papers on the theory of numbers.

H. A. Rowland, on the propagation of an arbitrary electro-magnetic disturbance, on spherical waves of light and the dynamical theory of diffraction.

W. E. Story, on the absolute classification of quadratic loci, and on their intersections with each other and with linear loci.

2. Six numbers of the American Chemical Journal have appeared within the year, bringing the series down to the third number of the sixth volume. They have contained papers by members of the University as follows: —

E. H. Keiser, estimation of sulphur in organic compounds.
H. N. Morse and W. S. Bayley, on haydenite.
Ira Remsen, on a new class of compounds analogous to the phthaleins; (and R. D. Coale,) on sinapic acid; (and W. C. Day,) oxidation of β-cymenesulphamide; (and E. H. Keiser,) on the conduct of moist phosphorus and air towards carbon monoxide; oxidation of para-dipropylbenzene-sulphamide; quantitative estimation of carbon in ordinary phosphorus.

3. The fourth volume of the American Journal of Philology has been completed during the year, and two numbers of the fifth volume have been issued. Papers by members of the University have appeared as follows: —

W. J. Alexander, participial periphrases in attic prose.
M. Bloomfield, on certain irregular vedic subjunctives or imperatives; on the probability of the existence of phonetic law.
A. M. Elliott, the Nahuatl-Spanish dialect of Nicaragua; verbal parasynthetics in *-a* in the Romance languages.
A. L. Frothingham, Jr., an historical sketch of Syriac literature and culture.
B. L. Gildersleeve, on the final sentence in Greek.
Paul Haupt, the Babylonian "woman's language."
J. R. Harris, stichometry.
E. H. Spieker, on direct speech introduced by a conjunction.
H. Wood, T. L. Beddoes, a survival in style.

4. Part one of volume three of the Studies from the Biological Laboratory was issued in March. It contained the following papers: —

H. W. Conn, significance of the larval skin of decapods; life history of thalassema.
H. L. Osborn, of the gill in some forms of prosobranchiate mollusca.

5. Ten numbers of the second volume of Studies in Historical and Political Science have appeared. They contain two papers by members of the University, namely: —

H. B. Adams, on methods of historical study.
R. T. Ely, on the past and present of political economy.

6. Six numbers of the University Circulars, containing 138 quarto pages have also been issued during the year. The Circulars are published at convenient intervals during the academic year for the purpose of communicating intelligence to the various members of the University in respect to work which is here in progress, as well as for the purpose of promulgating official announcements from the governing and teaching bodies. Although these Circulars are designed for the members of the University, they have frequently been called for by institutions and libraries at a distance, and also by individuals who are interested in the literary and scientific activity of this University. Subscriptions and exchanges are therefore received.

The Library.

The Library has continued to grow rapidly and now numbers 22,123 volumes. During the year many valuable gifts have been received of which

a list is given upon a later page. The number of periodicals, including the transactions of learned societies, which are taken in by subscription or by exchange is 420. If to this collection be added the list of those which are received by the Peabody Institute and other libraries of Baltimore, it will be seen that the student among us has ready access to all the chief sources of information in respect to the progress of science and literature.

The size of the library calls for enlarged accommodations. Notwithstanding the formation of several branch libraries, in connection with different lecture rooms, the shelf-room is still inadequate to the proper arrangement of the books. Strong objections have been made to the removal of portions of the collection to other buildings, and the Library Committee felt obliged in the course of the last winter to make public an expression of their opinion that the distribution of books had gone to a limit where it is best to stop. The bringing of the Bluntschli books to the floor above the principal reading room, and the placing there of other works in history and political science, have added greatly to the facilities for instruction and study in those branches of knowledge.

Our relations with the Library of the Peabody Institute and with the other libraries of Baltimore continue to be co-operative. It is a great

advantage to all who are engaged in important researches that so many of the long scientific series, so many of the collections of historical documents, and so many costly works in archæology have been brought together by the Peabody foundation and made accessible to those who can appreciate their value. The publication of the first volume of the catalogue, on which a vast amount of labor has been expended, renders the Peabody Library more accessible than ever. The Library of the Surgeon-General's Office in Washington is constantly made useful to students of Biology, and through the agency of the University is accessible also to those members of the medical profession in Baltimore who wish to borrow books. From other libraries at a distance books have been occasionally lent to us.

Mineralogical Cabinet.

Since the appointment of Dr. G. H. Williams to be an Associate in Mineralogy, increased attention has been given to the mineralogical cabinet, the nucleus of which was formed several years ago, under the superintendence of Dr. H. N. Morse. The collection is now well adapted to instruction and to private study, representing as it does nearly all the common species, and containing also a few specimens of unusual interest and value.

In order to facilitate advanced work in mineralogy, the most important pieces of apparatus used abroad in crystallographic and optical investigations of minerals have been secured, as well as a large set of both wooden and glass models of crystals for use in the lecture room. For special study of the microscopic structure of rocks, facilities are also afforded in keeping with the rapidly increasing interest manifested in this department of study. A microscope especially constructed for petrographical research, simple apparatus for preparing rock sections, together with a collection of nearly one thousand hand specimens of typical European rocks and between seven and eight hundred thin sections of rocks and minerals, prepared both in this country and in Europe, have recently been purchased, and are now, under proper guidance, placed at the disposal of students in appropriate rooms upon the third floor of the Chemical Laboratory.

The University has recently acquired by purchase a mineral collection, of sixteen hundred specimens, formed during the last twenty years by Professor O. D. Allen of the Sheffield Scientific School of Yale College. The specimens are of small size, but are choice and typical. Besides common minerals from the best localities, American and European, there are interesting suites, almost if not quite unique, from localities which were

explored and in some cases discovered by Professor Allen. Among them may be mentioned, chondrodite from the Tilly Foster Iron mine at Brewster, N. Y.; zircon, cancrinite, etc., from Litchfield, Me.; muscovite crystals from Buckfield, Me.; beryls from North Madison, Ct.; datolite from Tariffville, Ct., etc.

Another purchase has been made of a mineral collection, comprising some twelve hundred specimens, belonging to Professor Oren Root of Hamilton College. This is especially rich in crystals from Rossie and other old localities in northern New York, which are now no longer productive. A large suite of pseudomorphs in the Root collection, makes a valuable addition to the University Cabinet.

The thanks of the University are due to Mr. George T. Marye of San Francisco, who is gradually making for us a complete suite of the ores of the Pacific coast, which are forwarded to the University without charge by the liberality of Wells, Fargo & Co. and the Adams Express Company. Several beautiful specimens bought in Europe by Dr. Christopher Johnston of Baltimore, have been by him presented to the collection. Messrs. Hugh Sisson & Sons, manufacturers, have also given a set of specimens of polished marbles, selected to show a variety of

aspects. Other gifts have been received from Rt. Rev. Bishop Randolph, Dr. C. Pennington, and the Maryland Academy of Sciences.

EDUCATIONAL LECTURES.

For the sake of guiding in some degree the thoughts of those who are expecting to devote their lives to the work of teachers, a course of lectures was given last winter and spring by various instructors in this University. The audience was carefully restricted to the Fellows and to other graduate students, so that the lecturer might be conscious of the presence of a class who were personally prepared for and interested in the discussion of the topics proposed. The lectures were given in the chemical lecture room at ten o'clock on successive Saturdays, and the number of persons present was usually from sixty to seventy. The topics and the names of the lecturers are as follows:

I. The present state of university and collegiate instruction in this country, by D. C. Gilman.
II. Recent observations on educational foundations in Europe, by D. C. Gilman.
III. The educational value of grammar, by B. L. Gildersleeve.
IV. The future sphere of classical philology, by B. L. Gildersleeve.
V. The educational value of specialization and original work, by G. S. Hall.
VI. What to teach in biology, by H. N. Martin.
VII. Educational value of the study of chemistry, by I. Remsen.
VIII. Modern methods in the study of history, by H. B. Adams.
IX. Observational element in mathematics, by C. S. Peirce.
X. The naïve in education, by H. Wood.

A second course of weekly educational lectures has been arranged for the next academic year.

The undergraduates were also assembled as a body for the purpose of hearing several lectures more or less connected with their regular pursuits. The following topics were discussed by the lecturers whose names are given: —

Introductory lecture, by D. C. Gilman.
Four lectures on mental hygiene and moral regimen, by G. S. Hall.
On habits of literary composition, and on the preparation and correction of printer's copy, by W. H. Browne.
On the right uses of translations, by C. D. Morris.
On methods of physical training, by E. M. Hartwell.
On vocal culture, by C. L. Woodworth.
Reports on recent class-work respecting pre-historic archæology were made at one assembly, by some of the members of the class in history.

A course of five public lectures on educational topics was also given by Professor Hall.

Chesapeake Zoölogical Laboratory.

The report of the Director of the Chesapeake Zoölogical Laboratory, for the seventh year of its operations, is given in the appendix. In addition to what this laboratory has done for the advancement of science, it has been very useful to the fisheries of the Chesapeake by the light it has thrown on the natural history of the Oyster. During the past winter, Dr. W. K. Brooks, the Director, spent a great deal of time as a member of the Oyster Commission of the State of Maryland, in the preparation of a report to the

Legislature which embodies not only his discoveries in respect to the propagation of the oyster and the possibility of artificially developing the oyster in the very earliest stages of its life,—but also a vast amount of information in respect to the protection and improvement of the oyster fisheries. This report was published by the Legislature in a quarto volume, illustrated with maps and plates, and is likely to be the standard authority on this subject for a long period to come.

EXCURSION MAP OF BALTIMORE.

For several years the need of a good map of the neighborhood of Baltimore has been under discussion. In the course of last winter, Mr. A. L. Webster, formerly of the U. S. Geological Survey, acting in behalf of the Field Club of the Johns Hopkins University, presented to the Trustees a scheme for the construction, at a moderate cost, of an excursion map which should serve as a guide to the environs of Baltimore. His proposals were carefully considered and approved and the requisite appropriation for the map was made. The co-operation of the U. S. Coast and Geodetic Survey, and of the U. S. Geological Survey was secured, and the services of Mr. L. Nell, as a topographical draughtsman, were engaged. The map is now published on a scale of an inch

to the mile, and it gives the roads and brooks and water front with approximate accuracy. It lacks contours and other indications of the heights. The region covered is a square, the sides of which are twenty-five miles long. Only a few copies of the map have been printed, as it is the intention of those who are interested in it, to note all deficiencies and inaccuracies, and a short time hence to publish a second more complete edition.

Acknowledgments.

Many friends of the University have contributed during the year to its collections, and grateful acknowledgments are due to the persons below mentioned.

The gifts to the Library are so numerous that they are separately mentioned, as usual, in the appendix. Special acknowledgments may here be given to Messrs. Henry Holt & Co., Publishers, of New York, for continuing to send us their publications as they appear; and to Messrs. G. P. Putnam's Sons, for copies of several of the works which they have published.

A large and valuable collection of American newspapers, printed in New York and Philadelphia during the Civil War, was given to the University by Hon. S. C. Perkins of Philadelphia, who has also taken great pains to secure for us a collection of the municipal documents of Philadelphia, and of the State documents of Pennsylvania.

Mr. Mendez Cohen of Baltimore, and Dr. Henry M. Cohen of New York, for their liberality in contributing their interest and ownership in the Cohen collection of Egyptian antiquities.

Mr. William Ellinger for depositing in the historical rooms a valuable collection of lacustrine relics illustrating the stone and bronze ages in Switzerland.

Mr. A. L. Frothingham, Jr. for several terra cotta lamps, some of which were found in Christian catacombs, and some in the bed of the Tiber.

Mrs. Langdon Williams, L. Williams, and W. K. Williams for specimens of Etruscan and Roman pottery, and for a collection of Roman coins.

RT. REV. DR. RANDOLPH, of Virginia, for gifts of Indian relics.

COL. BENJAMIN TAYLOR, for gifts of Indian relics.

REV. CHARLES R. HALE, D. D., for depositing in the historical rooms his library of ecclesiastical history, to be there retained during his absence in Europe.

MRS. FRANCIS LIEBER, for depositing in the Bluntschli collection annotated copies of her husband's writings, with some other manuscripts of his, and for giving printed copies of his republished books. Having heard of the Lieber donation, JUDGE M. R. THAYER of Philadelphia, offered us as personal mementoes an ink-stand which belonged to Mr. Justice Story of the U. S. Supreme Court, and a pen which was Francis Lieber's.

At the request of Dr. Adams, Mrs. Lieber also presented to the historical rooms a bust, in plaster, of Dr. Lieber; and Mrs. Sparks presented a bust, in plaster, of Jared Sparks, the historian, once resident in Baltimore.

To the historical rooms, a friend of the University has given plaster casts of the busts of Cicero, Dante, John Locke, and Alexander Hamilton.

MR. J. S. CUMMINS, photographer, of Baltimore, has presented to the University large sized photographs of several members of the Faculty.

The departure from Baltimore of Professor Sylvester, led to the presentation of several likenesses of this eminent mathematician: — a portrait in oil by the artist, Mr. Harper Pennington of Baltimore; a likeness modelled in plaster by the artist, Mr Léonce Rabillon; a medallion likeness in electrotype, (from which the medal struck in commemoration of his connection with this University was cut), and a silver copy of the medal itself, presented by Mr. John W. McCoy. The medal was designed by Mr. Charles F. Barber, and was struck at the U. S. Mint in Philadelphia.

PROFESSOR MARTIN has given to the Biological laboratory engravings and photographs of Darwin, Huxley, Foster, Balfour, Ludwig, and Kronecker.

The Students in the Biological laboratory have presented a plaster cast of the bust of Charles Darwin, by C. Lehr, Jr.

Through the agency of the publishers, Messrs. G. P. Putnam's Sons, and at the request of Prof. R. D. Irving, forty pages of the autograph manuscript of Washington Irving, taken from the "Spanish Papers," have been given to the collection of historical autographs by Miss Catherine Irving and Mrs. Oscar Irving. Mr. E. A. Freeman has also sent the manuscript of his article on French-English Towns, and Hon. John H. B. Latrobe a MS. account of a visit which he made to President Madison, near the close of his life, at Montpellier.

LECTURES BY SIR WILLIAM THOMSON.

I am reluctant to wait for the completion of another year, before making mention of the important course delivered to the mathematical phys-

icists of this University by Sir William Thomson, Professor in the University of Glasgow. Professors and students of physics from other places were invited to follow these lectures, and thirty such persons attended with more or less regularity. Several professors, some of them from States in the far west, gave up their own classes and remained in Baltimore during the entire course.

The subject of the lectures was Molecular Dynamics, and they treated particularly of the wave theory of light. Stenographic notes were taken, which will soon be printed by the papyrograph process, and published. The course consisted of eighteen lectures, which were delivered between the first and nineteenth of October, 1884. In addition, the lecturer gave one public lecture on the Rigidity of the Earth.

At the conclusion of his course, those who had followed the lecturer united in an address of thanks to him, and in another to the Trustees of the University, and arrangements were made by the same persons to present to Sir William Thomson, as a memorial of his visit, one of the concave gratings devised by Professor Rowland for the study of the solar spectrum, and ruled under his direction.

Death of Mr. John W. Garrett.

As these pages are passing through the press, death has removed one of the original members of

the Board of Trustees, Mr. John W. Garrett, who died September 25, 1884.

In the foundation of this institution, Mr. Garrett co-operated heartily with the President and Professors, as well as with the Trustees. As it grew, he took pride in its increasing influence and in the prospect of its enduring strength, although in the latter part of his life he disagreed with a majority of the Trustees in regard to the purchase of additional land and the construction of additional buildings near the present site of the university class-rooms in the city of Baltimore.

To those who came to Baltimore as strangers, whether teachers or visitors, he extended a hospitable welcome which will always be remembered with gratitude. His reminiscences of the Founder, his desire that the city of his birth and residence should become a seat of the highest education, and his hope that new attractions would be added to those already given to Baltimore, were among the subjects on which he frequently conversed; and if his life had been spared, he would doubtless have matured certain plans on which his mind was thus known to be engaged. By a will which was dated near the close of his life, he made a generous contbution to the Association for the Improvement of the Condition of the Poor, and he directed that his executors should, out of the net income of his estate, devote the sum of $50,000 annually to such objects

of benevolence, to educational purposes, to aid virtuous and struggling persons, and to such works of public utility as are calculated to promote the happiness, usefulness, and progress of society, the apportionment of the gift to depend on the judgment and discretion of three members of his family, whom he designated as trustees.

Conclusion.

In concluding this report, I beg leave to express once more the confidence which I have, and which I believe to be shared by all those who are concerned in the instruction and government of this university, that the foundations are firmly laid, and that the superstructure is rising quite as rapidly as is best. We have seen thus far no reason to deviate, in any important particular, from the principles under which we began our work nine years or more ago. On the other hand, every year shows us that improvements can be made in the methods of administration and in the arrangements for the education of youth. As our numbers increase, more regulations are called for, and more care is requisite lest the teachers lose that personal acquaintance with the students which has hitherto been an excellent feature of our intercourse. I believe that every member of the academic staff is animated by a desire to be of

the utmost possible service to the pupils who are under his charge, and at the same time to make some positive contribution, even though it be not large, to the science he professes. I believe that our students are distinguished for their enthusiasm, their diligence, and their aspirations for that which is of good report.

It is to many persons at a distance a source of regret that the differences of opinion which separate into so many denominations the religious world, prevent our assuming any religious name, or wearing any ecclesiastical badge; but on the other hand it is a source of general satisfaction that here so many of those who are elsewhere separated can be united in the search after truth, and in the maintenance of faith. I believe that in the providence of God, this foundation is to be most useful in the development of character, and in teaching successive generations of young men to live uprightly. When this university began the Trustees expressed their wish that it should be free from sectarian bias, but should be pervaded by the spirit of enlightened Christianity. With a reiteration of that wish I close this ninth report.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, *November* 3, 1884.

APPENDIX.

A.

Professors, Associates, Etc., 1876-84.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN,		1875–

PROFESSORS.

BASIL L. GILDERSLEEVE,	*Greek*,	1876–
J. J. SYLVESTER,	*Mathematics*,	1876–1884.
IRA REMSEN,	*Chemistry*,	1876–
HENRY A. ROWLAND,	*Physics*,	1876–
H. NEWELL MARTIN,	*Biology*,	1876–
CHARLES D. MORRIS,	*Classics*, (*Collegiate*),	1876–
PAUL HAUPT,	*Shemitic Languages*,	1883–
G. STANLEY HALL,	*Psychology*,	1884–
WILLIAM H. WELCH,	*Pathology*,	1884–
SIMON NEWCOMB,	*Mathematics & Astronomy*,	1884–

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS,	*History*,	1883–
MAURICE BLOOMFIELD,	*Sanskrit*,	1883–
WILLIAM K. BROOKS,	*Morphology*,	1883–
THOMAS CRAIG,	*Applied Mathematics*,	1883–
CHARLES S. HASTINGS,	*Physics*,	1883–1884.
HARMON N. MORSE,	*Chemistry*,	1883–
WILLIAM E. STORY,	*Mathematics*,	1883–
MINTON WARREN,	*Latin*,	1883–
A. MARSHALL ELLIOTT,	*Romance Languages*,	1884–
J. RENDEL HARRIS,	*New Testament Greek*,	1884–

ASSOCIATES.

JOHN M. CROSS,	*Greek*,	1876–1881.
PHILIP R. UHLER,	*Natural History*,	1876–.
AUSTIN SCOTT,	*History*,	1876–1882.
A. MARSHALL ELLIOTT,	*Romance Philology*,	1876–1884.
THOMAS C. MURRAY,	*Shemitic*,	1876–1879.
HERMAN C. G. BRANDT,	*German*,	1876–1882.
WILLIAM K. BROOKS,	*Biology*,	1876–1883.
HARMON N. MORSE,	*Chemistry*,	1876–1883.
ROBERT RIDGWAY,	*Natural History*,	1876–1877.
WILLIAM E. STORY,	*Mathematics*,	1876–1883.
ARTHUR W. TYLER,	*Librarian*,	1876–1878.
CHARLES S. HASTINGS,	*Physics*,	1876–1883.
CHARLES R. LANMAN,	*Sanskrit*,	1877–1880.
HERBERT B. ADAMS,	*History*,	1878–1883.
ALBERT S. COOK,	*English*,	1879–1881.
MINTON WARREN,	*Latin*,	1879–1883.
WILLIAM HAND BROWNE,	*Librarian*,	1879–
HENRY SEWALL,	*Biology*,	1880–1882.
THOMAS CRAIG,	*Mathematics*,	1880–1883.
MAURICE BLOOMFIELD,	*Sanskrit*,	1881–1883.
WILLIAM T. SEDGWICK,	*Biology*,	1881–1883.
HENRY WOOD,	*English*,	1881–1884.
FABIAN FRANKLIN,	*Mathematics*,	1882–
RICHARD T. ELY,	*Political Economy*,	1882–
J. FRANKLIN JAMESON,	*History*,	1883–
GEORGE H. WILLIAMS,	*Mineralogy*,	1883–
EDWARD M. HARTWELL,	*Physical Training*,	1884–
HENRY WOOD,	*German*,	1884–
ARTHUR L. KIMBALL,	*Physics*,	1884–
WILLIAM T. COUNCILMAN,	*Pathology*,	1884–

LECTURERS.

Most of the persons named as lecturers have given courses of from six to twenty lectures. A few of them have given much longer courses, extending through half the year or through the entire year. In three cases, only single lectures have been given.

SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*,	1877.

Francis J. Child,	*Chaucer, Ballads, etc.,*	1877–1878.
Thomas M. Cooley,	*Law,*	1877–1879.
Julius E. Hilgard,	*Geodetic Surveys,*	1877.
James Russell Lowell,	*Romance Literature,*	1877.
John W. Mallet,	*Technological Chemistry,*	1877–1878.
Francis A. Walker,	*Political Economy,*	1877–1878.
William D. Whitney,	*Comparative Philology,*	1877.
William F. Allen,	*History,*	1878.
William James,	*Psychology,*	1878.
George S. Morris,	*Philosophy,*	1878–
J. Lewis Diman,	*History,*	1879.
H. Von Holst,	*History,*	1879.
William G. Farlow,	*Botany,*	1879.
J. Willard Gibbs,	*Theoretical Mechanics,*	1879.
Sidney Lanier,	*English Literature,*	1879–1881.
Charles S. Peirce,	*Logic,*	1879–1884.
John Trowbridge,	*Physics,*	1880.
A. Graham Bell,	*Phonology,*	1881.
S. P. Langley,	*Physics,*	1881.
John McCrady,	*Biology,*	1881.
James Bryce,	*Political Science,*	1881.
Edward A. Freeman,	*History,*	1881.
John J. Knox,	*Banking,*	1881.
Arthur Cayley,	*Mathematics,*	1882.
William W. Goodwin,	*Plato,*	1882.
G. Stanley Hall,	*Psychology,*	1882–1884.
Richard M. Venable,	*Constitutional Law,*	1882.
James A. Harrison,	*Anglo-Saxon,*	1882.
J. Rendel Harris,	*New Testament Greek,*	1882–1884.
George W. Cable,	*English Literature,*	1883.
William W. Story,	*Michel Angelo,*	1883.
Hiram Corson,	*English Literature,*	1883–
F. Seymour Haden,	*Etchers and Etching,*	1883.
John S. Billings,	*Municipal Hygiene,*	1883.
James Bryce,	*Roman Law,*	1883.
H. Von Holst,	*Political Science,*	1883.
William Trelease,	*Botany,*	1884.
J. Thacher Clarke,	*Explorations in Assos,*	1884.
Josiah Royce,	*Philosophy,*	1884.

WILLIAM J. STILLMAN,	*Archæology*,	1884.
CHARLES WALDSTEIN,	*Archæology*,	1884.
SIR WILLIAM THOMSON,	*Molecular Dynamics*,	1884.

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL,	*Biology*,	1876–1878.
SAMUEL F. CLARKE,	*Biology*,	1879–1881.
FABIAN FRANKLIN,	*Mathematics*,	1879–1882.
LYMAN B. HALL,	*Chemistry*,	1879–1880.
CHRISTIAN SIHLER,	*Biology*,	1879–1880.
HENRY C. ADAMS,	*Political Economy*,	1879–1881.
THOMAS CRAIG,	*Mathematics*,	1879–1880.
CHAS. L. WOODWORTH, JR.	*Elocution*,	1879–
WILLIAM T. SEDGWICK,	*Biology*,	1880–1881.
EDWIN H. HALL,	*Physics*,	1880–1881.
GEORGE H. STOCKBRIDGE,	*Latin and German*,	1880–1881.
PHILIPPE B. MARCOU,	*French*,	1880–1883.
HUGH NEWELL,	*Drawing*,	1880–
R. DORSEY COALE,	*Chemistry*,	1881–1883.
RICHARD T. ELY,	*Political Economy*,	1881–1882.
LAWRENCE B. FLETCHER,	*Physics*,	1881.
GEORGE F. NICOLASSEN,	*Greek and Latin*,	1881–1882.
BENJAMIN E. SMITH,	*Philosophy*,	1881–1882.
EDMUND B. WILSON,	*Biology*,	1881–1882.
JAMES W. BRIGHT,	*German*,	1882–1883.
J. FRANKLIN JAMESON,	*History*,	1882–1883.
EDWARD H. SPIEKER,	*Greek and Latin*,	1882–
HARRY F. REID,	*Physics*,	1882–1884.
CHARLES F. RADDATZ,	*German*,	1882–1884.
EDWARD M. HARTWELL,	*Physical Training*,	1883–1884.
HERBERT W. CONN,	*Osteology*,	1883–1884.
G. THEODORE DIPPOLD,	*German*,	1883–1884.
HENRY H. DONALDSON,	*Animal Physiology*,	1883–1884.
HENRY A. TODD,	*Romance Languages*,	1883–
OTTO LUGGER,	*Curator of Biol. Museum*,	1883–
CHARLES A. PERKINS,	*Physics*,	1884–
WILLIAM H. HOWELL,	*Biology*,	1884–
EDWARD H. KEISER,	*Chemistry*,	1884–

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

HENRY C. ADAMS, PH. D., . . . *Political Science,* . . 1876–1879.
Associate Professor of Political Economy, Cornell University; Lecturer on Political Economy, University of Michigan.

HERBERT B. ADAMS, PH. D., . . *History,* . . . 1876–1878.
Associate Professor of History, Johns Hopkins University.

WILLIAM K. BROOKS, PH. D., . . *Biology,* . . . 1876.
Associate Professor of Morphology, and Director of Chesapeake Zoölogical Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).

THOMAS CRAIG, PH. D., . . . *Mathematics,* . . 1876–1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.

JOSHUA W. GORE, C. E., . . . *Mathematics,* . . 1876–1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.

GEORGE B. HALSTED, PH. D., . . *Mathematics,* . . 1876–1878.
Professor of Mathematics, University of Texas.

EDWARD HART, PH. D., . . . *Chemistry,* . . . 1876–1878.
Assistant Professor of Chemistry, Lafayette College.

DANIEL W. HERING, C. E., . . *Engineering,* . . 1876–1878.
Professor of Mathematics, Western University of Pennsylvania.

MALVERN W. ILES, PH. D., . . *Chemistry,* . . . 1876–1878.
Chemist, Leadville, Colorado.

WILLIAM W. JACQUES, PH. D., . . *Physics,* . . . 1876–1879.
Instructor in Telegraph Engineering, Massachusetts Institute of Technology.

CHARLES R. LANMAN, PH. D., . . *Sanskrit,* . . . 1876–1877.
Professor of Sanskrit, Harvard University.

D. MCGREGOR MEANS, A. B., . . *Political Science,* . . 1876–1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.

HARMON N. MORSE, PH. D., . . *Chemistry,* . . . 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).

WALTER H. PAGE, ... *Greek,* . . . 1876–1878.
Late Professor in the Louisville (Ky.) High School.

P. PORTER POINIER, M. E., . . *Physics,* . . . 1876.
(*Died without entering upon the Fellowship, June,* 1876, *aged* 23 *years*).

E. DARWIN PRESTON, C. E., . . *Engineering,* . . 1876–1878.
U. S. Coast and Geodetic Survey; National Observatory, Cordoba, Argentine Republic.

HENRY J. RICE, SC. D., . . . *Biology*, . . . 1876–1878.
Professor of Natural Sciences, Brooklyn (N. Y.) High School.

JOSIAH ROYCE, PH. D., . . . *Philosophy*, . . 1876–1878.
Instructor in Philosophy, Harvard University.

ERNEST G. SIHLER, PH. D., . . *Greek*, . . . 1876–1879.
Classical Instructor, New York City.

FREDERICK B. VAN VORST, A. B., . *Ethics and Metaphysics*, 1876–1877.
Attorney at Law, New York City.

JOHN H. WHEELER, PH. D., . . *Philology*, . . . 1876–1877.
Professor of Greek, University of Virginia.

SAMUEL F. CLARKE, PH. D., . . *Biology*, . . . 1876–1879.
Professor of Natural History, Williams College.

LYMAN B. HALL, PH. D., . . . *Chemistry*, . . . 1877–1879.
Professor of Chemistry and Physics, Haverford College, Pa.

A. DUNCAN SAVAGE, B. LITT., . . *Greek*, . . . 1876–1879.

FABIAN FRANKLIN, PH. D., . . *Mathematics*, . . 1877–1879.
Associate in Mathematics, Johns Hopkins University.

CHRISTIAN SIHLER, PH. D., . . *Biology*, . . . 1877–1879.
Physician, Cleveland, Ohio.

FRANCIS G. ALLINSON, PH. D., . . *Greek and Sanskrit*, . 1877–1880.
Assistant Professor of Greek and Latin, Haverford College, 1880–82; Classical Instructor, Baltimore.

MAURICE BLOOMFIELD, PH. D., . . *Sanskrit and Greek*, . 1878–1879.
Associate Professor of Sanskrit, Johns Hopkins University.

CONSTANTINE FAHLBERG, PH. D., . *Chemistry*, . . . 1878–1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.

EDWIN H. HALL, PH. D., . . . *Physics*, . . . 1878–1880.
Instructor in Physics, Harvard University.

EDWARD COLES HARDING, A. M., . *Greek*, . . . 1878–1879.
Professor of Greek, University of Louisiana, 1879–80.

ISAAC OTT, M. D., ... *Biology*, . . . 1878–1879.
Physician, Easton, Pa.

HENRY SEWALL, PH. D., ... *Biology*, . . . 1878–1879.
Professor of Physiology, University of Michigan.

WASHINGTON I. STRINGHAM, PH. D., *Mathematics*, . . 1878–1880.
Professor of Mathematics, University of California.

ABRAM V. E. YOUNG, PH. B., . . *Chemistry*, . . . 1878–1880.

CHARLES R. HEMPHILL, A. M., . . *Greek*, . . . 1878–1879.
Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.

ALLAN MARQUAND, PH. D., . . *Logic and Ethics*, . 1877–1880.
Professor of the History of Art, Princeton College.

CHARLES A. VAN VELZER, S. B., . *Mathematics*, . . 1878–1881.
Assistant Professor of Mathematics, University of Wisconsin.

BROWN AYRES, S. B., ... *Physics*, . . . 1879–1880.
Professor of Physics, Tulane University, New Orleans.

LOUIS BEVIER, PH. D., . . . *Greek*, . . . 1879–1881.
Instructor in Rutgers College.

EDWARD M. HARTWELL, PH. D., . *Biology*, . . . 1879–1881.
Associate in Physical Training, Johns Hopkins University.

JOHN R. MCD. IRBY, PH. D., . . *Mineralogy*, . . 1879–1880.
(*Died March* 25, 1880, *aged* 25 *years*).

MITSURU KUHARA, PH. D., . . *Chemistry*, . . . 1879–1881.
Lecturer on Organic Chemistry, University of Tokio, Japan.

OSCAR H. MITCHELL, PH. D., . . *Mathematics*, . . 1879–1882.
Professor of Mathematics, Marietta College, Ohio.

EDWARD L. NICHOLS, PH. D., . . *Physics*, . . . 1879–1880.
Professor of Physics and Chemistry, University of Kansas.

WALDO S. PRATT, A. M., . . . *Aesthetics, etc.*, . . 1879–1880.
Instructor in Ecclesiastical Music. Theological Seminary, Hartford, Conn.

WILLIAM T. SEDGWICK, PH. D., . *Biology*, . . . 1879–1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.

HERMANN VOORHEES, C. E., . . *Chemistry*, . . . 1879.
(*Died without entering on the Fellowship, October* 14, 1879, *aged* 27 *years*).

CHARLES O. WHITMAN, PH. D., . . *Biology*, . . . 1879.
Professor of Zoölogy, University of Tokio, Japan, 1879-81; Marine Station, Naples, 1881–82. (*Resigned before entering on the Fellowship*).

EDMUND B. WILSON, PH. D., . . *Biology*, . . . 1879–1881.
Associate Professor (elect) of Biology, Bryn Mawr College, Pa.

GEORGE F. NICOLASSEN, PH. D., . *Greek*, . . . 1879–1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.

WILLIAM BURNEY, PH. D., . . *Chemistry*, . . . 1879–1880.
Professor of Chemistry, South Carolina Agricultural College.

ROBERT W. PRENTISS, S. B., . . *Mathematics*, . . 1879–1881.
Office of U. S. Nautical Almanac, Washington, D. C.

JAMES W. BRIGHT, PH. D., . . *Teutonic Languages*, . 1880–1882.
Fellow by Courtesy, Johns Hopkins University.

BENJAMIN C. BURT, A. M., . . *Philosophy*, . . 1880–1881.
Assistant Professor of English and Rhetoric, University of Michigan.

SPENCER H. FREEMAN, A. M., . . *Physics*, . . . 1880–1882.
Professor of Physics and Astronomy, Adelbert College, Western Reserve University, Ohio.

KAKICHI MITSUKURI, PH. D., . . *Biology*, . . . 1880–1881.
Professor of Zoölogy, University of Tokio, Japan.

BERNARD F. O'CONNOR, PH. D., . *Romance Languages*, . 1880–1882.
Instructor in French, Columbia College.

CHASE PALMER, PH. D., . . . *Chemistry*, . . . 1880–1882.
Professor of Chemistry, Massachusetts State Normal School, Salem, 1882–84.

HERBERT M. PERRY, A. B., . . *Mathematics*, . . 1880-1882.
Instructor in Mathematics, Cascadilla School, Ithaca, N. Y.

WILLIAM L. ROWLAND, S. B., . . *Chemistry*, . . . 1880.
(*Did not enter upon the Fellowship*).

EDWARD H. SPIEKER, PH. D., . . *Greek*, . . . 1880–1882.
Assistant in Greek and Latin, Johns Hopkins University.

MORRISON I. SWIFT, A. B., . . . *Philosophy*, . . 1880–1882.
Instructor in Logic and Political Economy, Hobart College, 1882–84; Fellow by Courtesy, Johns Hopkins University.

ARTHUR W. WHEELER, A. B., . . *Physics*, . . . 1880–1881.
(*Died, January* 6, 1881, *aged* 21 *years*).

R. DORSEY COALE, PH. D., . . . *Chemistry*, . . . 1880–1881.
Professor of Chemistry and Toxicology, University of Maryland.

A. F. WILHELM SCHIMPER, PH. D., . *Biology*, . . . 1880–1881.
University of Bonn, Germany.

LAWRENCE B. FLETCHER, PH. D., . *Physics*, . . . 1880–1881.
Instructor in Physics, Wesleyan University, Middletown, Conn., 1882–83.

WILLIAM J. ALEXANDER, PH. D., . *Greek*, . . . 1881–1883.
Professor of English, Dalhousie College, Nova Scotia.

EDWARD S. BURGESS, A. B., . . *Greek*, . . . 1881–1882.
Instructor, Washington (D. C.) High School.

WILLIAM J. COMSTOCK, PH. B., . . *Chemistry*, . . . 1881–1882.
Student of Chemistry, University of Munich.

WILLIAM C. DAY, PH. D., . . . *Chemistry*, . . . 1881–1883.
Professor of Chemistry and Physics, University of Nashville, Tenn.

HENRY H. DONALDSON, A. B., . . *Biology*, . . . 1881–1883.
Assistant in Biology, Johns Hopkins University, 1883–84; now Fellow by Courtesy.

WILLIAM P. DURFEE, PH. D., . . *Mathematics*, . . 1881–1883.
Instructor in charge of the department of Mathematics, Hobart College.

GEORGE S. ELY, PH. D., . . . *Mathematics*, . . 1881–1883.
Professor of Mathematics, Buchtel College, 1883–84; Examiner, U. S. Patent Office.

J. FRANKLIN JAMESON, PH. D., . *History*, . . . 1881–1882.
Associate in History, Johns Hopkins University.

C. HERSCHEL KOYL, A. B., . . *Physics*, . . . 1881–1883.

HENRY L. OSBORN, PH. D., . . *Biology*, . . . 1881–1882.
Instructor in Zoölogy, Purdue University, Lafayette, Indiana.

HENRY N. STOKES, PH. D., . . *Biology*, . . . 1881–1883.
Student of Chemistry in Europe.

BENJAMIN W. WELLS, PH. D., . . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I.

BENJAMIN I. GILMAN, A. B., . . *Logic*, . . . 1881–1882.
Student in Harvard University.

CHARLES J. BELL, A. B., . . . *Chemistry*, . . . 1882.
Professor of Chemistry, Pennsylvania State College, Center Co., Pa. (*Did not enter upon the Fellowship*).

JAMES M. CATTELL, A. B., . . . *Philosophy*, . . 1882–1883.
Student of Philosophy in Germany.

ELLERY W. DAVIS, PH. D., . . *Mathematics*, . . 1882–1884.
Professor of Mathematics and Military Tactics, Florida Agricultural College.

DAVID T. DAY, PH. D., . . . *Chemistry*, . . . 1882–1884.

ALFRED EMERSON, PH. D., . . *Greek*, . . . 1882–1884.
Instructor in Classical Archæology, Johns Hopkins University.

WILLIAM S. FLEMING, A. B., . . *Greek*, . . . 1882–1883.
Professor of Greek and German, Davidson College.

ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, . 1882–

HENRY R. GOODNOW, A. B., . . *Physics*, . . . 1882–1883.

ELGIN R. L. GOULD, A. B., . . *History*, . . . 1882–1884.
Instructor in History, Washington (D. C.) High School.

ARTHUR S. HATHAWAY, S. B., . . *Mathematics*, . . 1882–1884.
Fellow by Courtesy, Johns Hopkins University.

WILLIAM H. HOWELL, PH. D., . . *Biology*, . . . 1882–1884.
Assistant in Biology, Johns Hopkins University.

ARTHUR L. KIMBALL, PH. D., . . *Physics*, . . . 1882–1883.
Associate in Physics, Johns Hopkins University.

HARRY F. REID, A. B., . . . *Physics*, . . . 1882.
Student of Physics in Germany.

EDWARD H. KEISER, PH. D., . . *Chemistry*, . . . 1882–1884.
Assistant in Chemistry, Johns Hopkins University.

WILLIAM M. ARNOLT B. D. . . *Greek*, . . . 1883–

GUSTAV BISSING, A. B., . . *Mathematics*, . . 1883–1884.
Examiner, U. S. Patent Office.

ADAM T. BRUCE, A. B., . . . *Biology*, . . . 1883–1884.
Johns Hopkins University.

ARCHIBALD L. DANIELS, A. B., . . *Mathematics*, . . 1883–1884.
Instructor in Mathematics, Princeton College.

JOHN DEWEY, PH. D., . . . *Philosophy*, . . 1883–1884.
Instructor in Philosophy, University of Michigan.

JAMES R. DUGGAN, PH. D., . . *Chemistry*, . . . 1883–

HANS C. G. VON JAGEMANN, PH. D., . *Modern Languages*, . 1883–1884.
Professor of Modern Languages, Earlham College, Richmond, Ind.

GUSTAV A. LIEBIG, JR., A. B., . . *Physics*, . . . 1883–

C. W. EMIL MILLER, A. B., . . *Greek*, . . . 1883–

CHARLES A. PERKINS, PH. D., . . *Physics*, . . . 1883–1884.
Assistant in Physics, Johns Hopkins University.

LEWIS T. STEVENS, A. B., . . . *Biology*, . . . 1883–1884.
Student of Medicine, Harvard University.

LEWIS W. WILHELM, PH. D., . . *History*, . . . 1883–1884.
Fellow by Courtesy, Johns Hopkins University.

ETHAN A. ANDREWS, PH. B., . . *Biology*, . . . 1884–

HENRY CREW, A. B., ... *Physics*, . . . 1884–

HOMER W. HILLYER, S. B., . . *Chemistry*, . . . 1884–

ABEL H. HUIZINGA, A. B., . . . *Shemitic Languages*, . 1884–

FREDERIC S. LEE, A. B., . . . *Biology*, . . . 1884–

CHARLES H. LEVERMORE, A. B., . *History*, . . . 1884–

HENRY F. NACHTRIEB, S. B., . . *Biology*, . . . 1884–

HENRY B. NIXON, ... *Mathematics*, . . 1884–

WILLIAM NOYES, JR., . . . *Psychology*, . . 1884–

ALBERT G. PALMER, A. B., . . *Chemistry*, . . . 1884–

ERNEST M. PEASE, A. B., . . . *Latin*, . . . 1884–

ALBERT H. TOLMAN, A. B., . . *English*, . . . 1884.
Professor of English Literature and Rhetoric, in Ripon College, Wisc. (*Resigned before entering on the Fellowship*).

WOODROW WILSON, A. B., . . . *History*, . . . 1884–

C.

Graduates.

DEGREES CONFERRED HONORIS CAUSA.

1880.

HENRY A. ROWLAND, PH. D.
Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D.
President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F).
A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Associate Professor of Political Economy, Cornell University.

THOMAS CRAIG. (F).
C. E., Lafayette, 1875.—Associate Professor of Mathematics, Johns Hopkins University.

JOSIAH ROYCE. (F).
A. B., Univ. of California, 1875.—Instructor in Philosophy, Harvard University.

ERNEST GOTTLIEB SIHLER. (F).
Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F).
A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F).
Ph. B., Yale, 1878.—Professor of Natural History, Williams College.

GEORGE BRUCE HALSTED. (F).
A. B., Princeton, 1875.—Professor of Mathematics, University of Texas.

EDWARD HART. (F).
S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.

WILLIAM WHITE JACQUES. (F).
S. B., Mass. Inst. of Technology, 1876.—Instructor in Telegraph Engineering, Massachusetts Institute of Technology.

HENRY SEWALL. (F).
S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY.
Engaged in mercantile pursuits, Baltimore.

CHASE PALMER. (F).
Professor of Chemistry, Massachusetts State Normal School, 1882-84.

EDWARD HENRY SPIEKER. (F).
Assistant in Greek and Latin, Johns Hopkins University. (3)

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F).
A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.

FABIAN FRANKLIN. (F).
Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.

EDWIN HERBERT HALL. (F).
A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.

ALLAN MARQUAND. (F).
A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.

WASHINGTON IRVING STRINGHAM. (F).
A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF.
Student of Theology, Yale College.

ALLEN KERR BOND.
M. D., University of Maryland, 1882.—Physician, Baltimore.

WILLIAM CATHCART DAY. (F).
Professor of Chemistry and Physics, University of Nashville, Tenn.

HENRY LAURENCE GANTT.
M. E., Stevens Institute of Technology, 1884.—Mechanical Engineer, Baltimore.

EDGAR GOODMAN.
LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER.
Minister of the Protestant Episcopal Church, Hancock, Md.

ALEXANDER FRIDGE JAMIESON.
Instructor, Trenton, N. J.

*EDMUND ALLEN JARVIS.
Died October 15, 1880, aged 22 years.

STEWART BRIAN LINTHICUM.
LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.

JOHN HANSON LOWE.
LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

LEIGH CLINTON MORGAN.
Minister of the Protestant Episcopal Church, Brooklyn, N. Y.

NELSON PALMER.
Baltimore.

THOMAS PETTIGREW.
Creswell, N. C.

HARRY FIELDING REID. (F).
Assistant in Physics, Johns Hopkins University, 1882-84.—Now Student of Physics in Berlin.

WILTZ RAYMOND STRICKLEN.
Minister of the Methodist Episcopal Church, Maryland.

LEWIS WEBB WILHELM. (F).
Johns Hopkins University. (16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F).
A. B., Rutgers, 1878; Instructor in Rutgers College.

ROBERT DORSEY COALE. (F).
Professor of Chemistry and Toxicology, University of Maryland.

EDWARD ALLEN FAY.
A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F).
A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University, 1882-84.

SAMUEL GARNER.
A. B., St. Johns, 1871.—Professor of Modern Languages, University of Indiana.

EDWARD MUSSEY HARTWELL. (F).
A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Associate in Physical Training, Johns Hopkins University.

WILLIAM THOMPSON SEDGWICK. (F).
Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.

CHRISTIAN SIHLER. (F).
Concordia, 1866.—Physician, Cleveland, O.

EDMUND BEECHER WILSON. (F).
Ph. B., Yale, 1878.—Lecturer on Biology, Williams College, 1883-84; Associate Professor (elect) of Biology, Bryn Mawr College. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN.
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

HENRY JOHNS BOWDOIN.
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

JOHN WILSON BROWN.
Baltimore.

DAVID TALBOTT DAY. (F).
Johns Hopkins University.

WILLIAM HENRY HOWELL. (F).
Assistant in Biology, Johns Hopkins University.

JOHN JOHNSON.
Instructor, McDonogh School.

JAMES EDWARD KEELER.
Assistant, Allegheny (Pa.) Astronomical Observatory.

EDWIN GEORGE RICHARDSON.
Clergyman of the Protestant Episcopal Church, Newark, N. J.

ADONIRAM JUDSON ROBINSON.
Instructor in Baltimore City College.

HENRY ROLANDO.
M. D., University of Maryland, 1883.—Now connected with Presbyterian Hospital, New York City.

LEE SALE.
Student of Law, St. Louis, Mo.

MACTIER WARFIELD.
M. D., University of Maryland, 1884.—Physician, Baltimore. (12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F).
A. B., Lafayette, 1877.—Fellow by Courtesy, Johns Hopkins University.

JOHN FRANKLIN JAMESON. (F).
A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

MITSURU KUHARA. (F).
S. B., University of Tokio, 1877.—Lecturer on Organic Chemistry, University of Tokio.

ROBERT W. MAHON.
C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College.

OSCAR HOWARD MITCHELL. (F).
A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F).
A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES.
A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.

CHASE PALMER. (F).
A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School, 1882-84.

EDWARD HENRY SPIEKER. (F).
A. B., Johns Hopkins, 1879.—Assistant in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS.
LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

THOMAS ALEXIS BERRY.
Graduate Student, Johns Hopkins University.

GUSTAV BISSING. (F).
Fellow, Johns Hopkins University, 1883-84.—Examiner, U. S. Patent Office.

WALTER BERNARD CLARKSON.
Principal of the Duval High School, Jacksonville, Fla.

HERMANN LOUIS EBELING.
Instructor, Bloomfield, N. J.

LOUIS GARTHE.
Baltimore.

EDWARD INGLE.
Graduate Student, Johns Hopkins University.

RICHARD FULLER KIMBALL.
LL. B., University of Maryland, 1884.—Attorney at Law, Baltimore.

GUSTAV ADOLPH LIEBIG, JR. (F).
Fellow, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER. (F).
Fellow, Johns Hopkins University.

JAMES PAGE.
Student, Mass. Institute of Technology.

ALBERT GALLATIN PALMER. (F).
Fellow, Johns Hopkins University.

ROBERT MILLER REESE.
Baltimore.

LEWIS TEBBETTS STEVENS. (F).
Student of Medicine, Harvard University.

HERBERT THORNDYKE TIFFANY.
Student of Law, Baltimore. (15)

1883.

DOCTORS OF PHILOSOPHY.

WILLIAM JOHN ALEXANDER. (F).
A. B., University of London, 1876.—Professor of English Literature, Dalhousie College, Nova Scotia.

WILLIAM CATHCART DAY. (F).
A. B., Johns Hopkins University, 1880.—Professor of Chemistry and Physics, University of Nashville, Tennessee.

WILLIAM PITT DURFEE. (F).
A. B., University of Michigan, 1876.—Instructor in Mathematics, Hobart College.

GEORGE STETSON ELY. (F).
A. B., Amherst College, 1878; Professor of Mathematics, Buchtel College, 1883-84.—Examiner, U. S. Patent Office.

KAKICHI MITSUKURI. (F).
Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F).
Bach. ès Lettres, Université de France, 1874.—Instructor in French, Columbia College. (6)

BACHELORS OF ARTS.

WILLIAM SHIRLEY BAYLEY.
Graduate Scholar, Johns Hopkins University.

MAURICE FELS.
Student of Law, Philadelphia.

DAVID STERRETT GITTINGS.
Student of Law, Baltimore.

WILLIAM BEATTY HARLAN.
Student of Law, University of Maryland.

GEORGE THEOPHILUS KEMP.
Graduate Scholar, Johns Hopkins University.

GONZALEZ LODGE.
Graduate Scholar, Johns Hopkins University.

WILLIAM EDGAR STRATTON.
Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS.
Student of Law, Baltimore.

HENRY VANPETERS WILSON.
Baltimore.

WILLIAM JOHN WITZENBACHER.
Instructor in the McDonogh School. (10)

1884.

DOCTORS OF PHILOSOPHY.

HERBERT WILLIAM CONN.
A. B., Boston University, 1881.—Professor of Zoölogy, Wesleyan University, Conn.

ELLERY WILLIAM DAVIS. (F).
S. B., University of Wisconsin, 1879.—Professor of Mathematics and Military Tactics, Florida Agricultural College.

DAVID TALBOTT DAY. (F).
A. B., Johns Hopkins, 1881.

JOHN DEWEY. (F).
A. B., University of Vermont, 1879.—Instructor in Philosophy, University of Michigan.

JAMES REYNOLDS DUGGAN. (F).
A. B., Mercer University, 1877.—Fellow in Chemistry, Johns Hopkins University.

WILLIAM HENRY HOWELL. (F).
A. B., Johns Hopkins, 1881.—Assistant in Biology, Johns Hopkins University.

HANS CARL GÜNTHER VON JAGEMANN. (F).
Naumburg Gymnasium, 1876.—Professor of Modern Languages, Earlham College.

EDWARD HARRISON KEISER. (F).
S. B., Swarthmore, 1880.—Assistant in Chemistry, Johns Hopkins University.

ARTHUR LALANDE KIMBALL. (F).
A. B., Princeton, 1881.—Associate in Physics, Johns Hopkins University.

HENRY LESLIE OSBORN. (F).
A. B., Wesleyan, 1878.—Instructor in Zoölogy, Purdue University, Indiana.

CHARLES ALBERT PERKINS. (F).
A. B., Williams, 1879.—Assistant in Physics, Johns Hopkins University.

ALBERT SHAW.
A. B., Iowa College, 1879.—Journalist, Minneapolis, Minnesota.

HENRY NEWLIN STOKES. (F).
S. B., Haverford, 1879.—Student of Chemistry in Europe.

LEWIS WEBB WILHELM. (F).
A. B., Johns Hopkins, 1880.—Fellow by Courtesy, Johns Hopkins University.

ARTHUR YAGER.
A. B., Georgetown College, Kentucky, 1879.—Professor of History, Georgetown College, Ky. (15)

BACHELORS OF ARTS.

ALBERT CLAYTON APPLEGARTH.
Graduate Student, Johns Hopkins University.

CHARLES WALTER ARTZ.
Student of Law, Columbia College.

WALTER BLISS CANFIELD.
Graduate Student, Johns Hopkins University.

GEORGE GIBSON CAREY, JR.
Student of Law, University of Maryland.

WILLIAM KENNEDY CROMWELL.
Student of Law, Harvard University.

CHARLES WILLIAM RAMMELSBERG CRUM.
Instructor in Mathematics, Mercersburg College, Pa.

HARRY FRIEDENWALD.
Student of Medicine, College of Physicians and Surgeons, Baltimore.

WILLIAM LINDSAY GLENN.
Graduate Scholar, Johns Hopkins University.

JOHN HINKLEY.
Student of Law, University of Maryland.

CHARLES HOWARD HOWARD.
Graduate Student, Johns Hopkins University.

JOHN DEERING LORD, JR.
Student of Law, Columbia College.

JERE WILLIAMS LORD.
Student of Medicine, University of Pennsylvania.

WILLIAM PATRICK LYONS.
Student of Law, University of Maryland.

EDGAR GEORGE MILLER, JR.
Graduate Student, Johns Hopkins University.

WILLIAM RIDGELY ORNDORFF.
Graduate Student, Johns Hopkins University.

GEORGE DOBBIN PENNIMAN.
Student of Law, University of Maryland.

WILLIAM H. PERKINS, JR.
Graduate Student, Johns Hopkins University.

GEORGE CLEMENT STOKES, JR.
Graduate Student, Johns Hopkins University.

WILLIAM JONES THOMAS.
Professor of Mathematics, Western Maryland College.

WILLIAM FERDINAND WALZ.
Graduate Student, Johns Hopkins University.

FREDERICK HENRY WILKENS.
Student in the University of Berlin, Germany.

GEORGE WISHART EDMOND, (*extra ordinem*).
Graduate Student, Johns Hopkins University.

CHARLES HOWARD SHINN, (*extra ordinem*).
New York City. (23)

TOTAL (1878-84).

DOCTORS OF PHILOSOPHY, ...	54
BACHELORS OF ARTS, ...	79

D.

Report of the Chesapeake Zoölogical Laboratory.

SESSION OF 1884.

To the President of the Johns Hopkins University:

SIR: I take pleasure in handing to you, at your request, the report of the seventh annual session of the marine laboratory of the University.

The laboratory was open for research, at Beaufort, North Carolina, from June 1st to September 19th, and its facilities were used by the following naturalists:

W. K. BROOKS, *Director.*
H. W. Conn, *Assistant in charge.*
E. A. Andrews, *Fellow J. H. U.*
Wm. Bateson, *University of Cambridge, England.*
H. H. Donaldson, *J. H. U.*
E. A. Hartwell, *Teacher, Fitchburg, Mass.*
G. F. Kemp, *J. H. U.*
J. Nelson, *J. H. U.*
H. F. Nachtrieb, *Fellow J. H. U.*
H. L. Osborn, *Instructor in Zoölogy, Purdue University, Lafayette, Ind.*

(23) Owing to the illness of the director he was able to spend only one month at the laboratory, and it was, for two months, in charge of H. W. Conn, Ph. D., Professor of Zoölogy at the Wesleyan University, Middletown, Conn.

Our experiment, of a year since, in the Chesapeake Bay, has demonstrated that Beaufort is the best available locality for our work, and our outfit was accordingly moved back from Hampton to Beaufort, in June, and the house which we had occupied in 1880–81 and '82 was again rented for occupation as a laboratory. The expenses of removal, together with the illness of the director, compelled us to make our season much shorter than usual, and the laboratory was occupied for only fifteen weeks.

The building at Beaufort furnishes accommodations for only six persons, and as our party of ten crowded it so much as to hamper our work I was compelled to refuse several applicants.

The following subjects among others were studied by the members of the party: The embryology of Echinoderms; the systematic zoölogy and anatomy and embryology of Annelids; the embryology of Medusae.

Dr. Conn has completed his work on the development of Thalassema, and his paper is ready for publication. He has also made many additions to a subject upon which he has been engaged for three years past,—a mono-

graph upon the Crabs of Beaufort. This work is now nearly completed and ready for publication, and will form a large volume with about twenty-five quarto plates. He has also studied the development of Serpula, and an abstract of his observations is now in press. The most important points are that the blastopore elongates and closes in such a manner that one extremity becomes the mouth and the other the anus, while the closed lips form the ventral surface. Mr. Conn has also prepared a paper on larval forms, which is to appear in the *Studies from the Biological Laboratory.*

Dr. Donaldson was occupied for three months in the study of the physiology of marine invertebrates. He made many experiments to determine the relative susceptibility of the different classes of invertebrates to poisons of vegetable origin. He also carried on a series of experiments to determine whether the current theory of digestion in the Actinozoa is correct. These experiments failed to support the theory.

The results of Mr. Bateson's work upon Balanoglossus last year, were published in England last winter, and were regarded as of such importance that a grant of money was given by the Royal Society, to enable him to return to Beaufort this season and complete them. His more recent researches seem to show that Balanoglossus presents many features of relationship to the Echinoderms and also many points of resemblance to the Vertebrates. An abstract of his conclusions was read at the Montreal meeting of the British Association.

Dr. Osborn has studied the embryology of Fulgur and Neptunia, and a short abstract of his results is now in press. A longer illustrated paper will be ready for publication this winter. His results show that the gill of Neptunia arises as a series of perfectly simple folds, upon the *outer surface* of the animal, and before the mantle cavity is formed, and as the mantle cavity is formed these folds are carried into it. He believes that this is the primitive condition of the gills of Gasteropods, and that the formation of a "ctenidium" is secondary. He has also studied the origin of the body cavity and reproductive organs of Gasteropods.

The early stages of Teleosts, and of Limulus have also been studied.

I have made many additions to my notes on the Medusae of Beaufort, and my monograph upon this subject, upon which I have been engaged for five years, is now sufficiently advanced for publication, as soon as a publisher can be found. It will form a large volume, with about thirty quarto plates.

I have now in press an abstract of my observations, made this summer upon the embryology of Eutimia. The following are some of the more important points. Delamination takes place over the whole inner surface of the blastoderm, and the digestive cavity is not obliterated. After the endoderm has been formed, the ectoderm becomes deeply invaginated, to form the adhesive gland of the planula. The planula does not become converted into a hydranth, but becomes a root, from which hydranths are formed by budding.

An illustrated paper upon the embryology of Eutimia and Liriope is now in preparation for the *Studies from the Biological Laboratory,* and it will be ready for publication this winter.

I was also able this summer to make a few observations upon the metamorphosis of Stomatopods, and these will be incorporated in my report on the Stomatopods of the Challenger Expedition, which will be ready for the press in March, 1885.

I have also in preparation, a paper, based on observations made this summer, on the origin of alternation in hydroids. This will be ready for publication in the *Studies* this winter, and I shall give facts which I believe to show that in this group, alternation has not originated through polymorphism, or division of labor, but through the asexual multiplication of immature larvae.

The following papers, based upon researches which are carried on at the marine laboratory have appeared since my last report, and five or six other papers are now in press, and will appear immediately.

On the Gill in some forms of Prosobranchiate Mollusca, by H. L. Osborn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with three plates.

Life History of Thalassema, (abstract), by H. W. Conn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with one plate.

The Significance of the Larval Skin of Decapods, by H. W. Conn. *Studies from the Biological Laboratory*, vol. iii, no. 1, with two plates.

On the Osteology of Syngnathus Peckeanus, by J. P. McMurrich. *University Circulars*, iii, 27.

An Instance of Sexual Variation in Crustacea, by H. W. Conn. *University Circulars*, iii, 27.

Abstract of Observations on the Development of Balanoglossus, by Wm. Bateson. *University Circulars*, iii, 27.

On the Osteology and Development of Syngnathus Peckeanus, by J. Playfair McMurrich. *Quart. Journ. Mic. Sc.*, vol. 23, (*October,*) 623–650, with two plates.

Upon the Ears of Fishes, with reference to the Function of Equilibrium, by H. Sewall. *Journal of Physiology*, iv, 339.

The Early Stages in the Development of Balanoglossus, by Wm. Bateson. *Quart. Journ. Mic. Science*, no. xciv, 208, with four plates.

Dr. H. J. Rice, a former Fellow of the University, writes that he has, in a pond at Cold Spring Harbor, a fine set of young oysters, which he has reared from the egg by methods which were first made known at the laboratory.

Respectfully,

W. K. Brooks,
Director, Chesapeake Zoölogical Laboratory.

Baltimore, *November*, 1884.

E.

Report on the Work in Archæology.

To the President of the Johns Hopkins University:

SIR: In accordance with your request that I would prepare a connected statement of what has been done during the past year in this University to encourage the study of Archæology, I send you the following report:—

A course of public lectures on Classical Archæology was given in Hopkins Hall during the spring months. The opening lecture, (January 14), by Dr. Waldstein, director of the Fitzwilliam Museum at Cambridge, (England), treated of the Influence of Athletic Games on Greek Art, from the time of its transition from the archaic stage to a closer study of the human form, until finally professional athleticism signalled a decline in the standard of taste and of art.

Mr. Joseph T. Clarke, who was in charge of the American archæological expedition to Assos, began his course (March 10) with a Plea for Practical Archæology, showing how the practical work accomplished in the present century has raised this study to the rank of a science; whereas, in the past, the immense material at hand could not be put to its proper use from the want of critical spirit. His two following lectures (March 12 and 14) were devoted to an account of the city of Assos, as disclosed by the excavations carried on for more than two years by the Archæological Institute. Besides the well known temple, with its interesting reliefs, the buildings of the Agora or market-place are unique for the insight they give us into the Greek methods of construction. They comprise the immense Stoa, the Bouleuterion, and the Bath. The series is completed by the Theatre, the Gymnasion, and the interesting street of tombs. The concluding lecture (March 17) on the Cyrenaica showed the exceptional advantages which would attend excavations in this early Greek colony, as yet almost unexplored. The city of Cyrene, with its extensive ruins above ground, offers peculiar attractions to the explorer.

Mr. W. J. Stillman, late U. S. Consul in Crete, lectured on March 19, 21 and 24. Prehistoric Research in the Classical Field formed the subject of his first lecture. He expressed the view that the ruins in Italy and Greece, that are commonly called Cyclopean or Pelasgic, were the work of a Pelasgic civilization which, having its seat in lower or central Italy moved southward leaving traces of its passage in Sicily, along the Illyrian shore, and especially through the Peloponnesus and Crete. The second lecture treated of the State of Research in Greece, and the great harm done to Art history and investigation by repressive laws concerning archæological researches. A well organized American school—not exciting like those of other nations the susceptibilities of the Greeks—would be the most potent possible agency

to bring about a modification of the present law. In his third lecture, on the Relations of Art to Archæology, Mr. Stillman argued that true art was not imitation of nature, but the expression of an ideal of the human mind.

Dr. A. Emerson, Fellow in Greek, gave six lectures on Olympia, (March 26 to April 7.) He first gave an historical sketch of the Olympic festival, and described the various contests which took place on each of the five days during which the festival lasted. The people of Elis were the managers of the games, and this curatorship preserved to Elis its early independence. The character of the games declined greatly during the Roman period, until they were finally prohibited by Theodosius in 394. Although burned in 426, the temple of Zeus does not seem to have been fully destroyed until the great earthquake of 551. Of the architectural monuments of the Altis, the Heraion and the temple of Zeus were the most important. The former building, of uncertain but early date, establishes the wooden derivation of the Doric style. The temple of Zeus was founded in the 77th Olympiad by the Elean architect, Libon. Paionios was the author of the sculptures of the Eastern pediment, and Alkamenes filled the Western pediment; the whole being under the direction of Paionios, who was awarded the prize in the competition. The sculptures of both pediments have been so far recovered by the German explorers that restorations in general unessential have been sufficient to complete them. Two *chefs d'œuvre* of free sculpture were also found in the excavations: the colossal marble Victory, by Paionios, and the Hermes holding the infant Dionysos, an early work of Praxiteles.

The concluding lecture (April 9) was by Professor Gildersleeve on the Relations of Literary and Plastic Art. The history of both these incorporations of national life shows many points of resemblance which were dwelt on in some detail. Our age has a better appreciation of both literature and art and these studies ought not to be dissociated.

In February, an Archæological Society was formed at the University for the voluntary prosecution of this study. Its meetings, which took place monthly, included the reading of papers on Ancient and Christian Art and reports on recent discoveries and investigations. At the first meeting (February 16), Dr. Frothingham discoursed on the study, past and present, of Christian Archæology, and its importance for obtaining a comprehensive view of history. Dr. Emerson reviewed the history of the study of Classical Archæology among civilized nations, especially during the last forty years. Maj. J. W. Powell, Director of the U. S. Bureau of Ethnology, gave an address on the Archæology of the Aboriginal Races of the United States, sketching the condition of handicraft among the different tribes. The meeting of March 14 was addressed by Mr. Clarke on the subject of the Entasis in Greek architecture, giving the results of original researches on the nature of the curved outlines of columns, employed by the Greeks to overcome an optical deception. Mr. Hoskins made a report on the collection of casts in the Peabody Institute. Mr. Stillman addressed the next

meeting (March 22) on the Acropolis of Athens, describing its site, the means of access, and the principal buildings (the Parthenon and the Erechtheum); the lecture was illustrated by numerous photographs. A report on the works regarding ancient art contained in the Peabody Library was made by Dr. Emerson. At the last meeting (May 9) Dr. Frothingham read a paper on the history of Mosaic-painting since the Christian era, emphasizing the important place it holds in art-history, as it furnishes an almost unbroken series of well-preserved works during a period of twelve centuries. Dr. Emerson showed the interest of a well-organized and classified collection of electrotype reproductions of ancient coins.

In connection with the Society, Dr. Frothingham organized several circles for the study of various phases of Art, illustrated by photographs and art-books. At weekly meetings the following subjects were examined:

Romanesque Architecture. (March 1).
Gothic Architecture. (March 8).
Italian Sculpture during the XIII–XIV centuries. (March 22).
Italian Painting during the XIV century. (March 29).
Italian Painting during the XV century. (April 5).
Ivory Carving from the IV to the XIV century. (May 3).

The object of these informal lectures was to give a general idea of the subject studied, supported by such numerous representations as should give familiarity with the most characteristic works of the period.

The Archæological Institute of America which was founded five years ago for the promotion of archæological research and discovery on classical and American soil, has been during this time centred in Boston, although New York also furnished a considerable number of members. Feeling the danger of an interest too much centralized to be long efficient, the Council of the Institute at its meeting in Boston (May 17, 1884), proposed a new constitution by which the Institute should consist of affiliated societies in various cities. Wherever at least ten members organize they may form an affiliated society and send a member to the general council; a membership of fifty gives the right to a second delegate. Beside sharing in the general advantages of the Institute and influencing the work undertaken by it, these societies may create local interest by meetings, publications, etc. In order to further the formation of such a society in Baltimore, the University Archæological Society appointed Drs. Emerson and Frothingham as a committee. In a short time an organization of twenty-four members was formed and the "Baltimore branch of the Archæological Institute of America" was organized on June 5, with Mr. J. W. McCoy as president, and Drs. Emerson and Frothingham as recording and corresponding secretaries.

This newly formed society is quite distinct, both in its organization and in its aims, from that of the Johns Hopkins Archæological Society. The object of the University society is to excite among students in the various departments, an interest in the subject of art history and the first manifesta-

tions of early civilizations. It aims to attract the student of psychology by aesthetics, the student of history and philology by the valuable aid and suggestions it affords to both these departments.

The Baltimore branch of the American Institute, on the other hand, if it continue the custom which has hitherto been followed, will have but two meetings in the year. It consists both of those who take an active part in archæological work and of the patrons of art who are interested in furthering the efforts of American workers in a field so well cultivated by other nations. There can be no doubt that Baltimore will take, as is its due, an important share in giving this encouragement.

The valuable Cohen collection of Egyptian Antiquities, which has recently been acquired by the University, will be of great interest, not only for art, but for the historical study of the customs and laws of Egypt. It was begun in 1832 by Col. M. I. Cohen during his travels in Egypt, and consists of six hundred and eighty nine objects procured mainly in the localities where they were originally discovered. A number of objects, however, belonged to the famous collection of Mr. Salt, H. M. consul in Egypt, which was sold in 1835. The collection consists chiefly of small works illustrating the history of the minor arts in Egypt from the XVIII dynasty to that of the Ptolemies.

The University has also purchased plaster casts, on a reduced scale of 1:10, of the two pediments of the temple of Zeus at Olympia. They had recently been executed at Berlin, under the direction of Curtius and Hirschfeld, by the sculptor Grüttner.

The University, in connection with other American institutions, has continued for several years its subscription for the maintenance of the school of Classical Archæology at Athens.

A word may be now said on future work. One great difficulty in giving an educational impulse to studies in art history, especially for beginners, is the lack of reproductions from the originals. A systematic collection of photographs would be a most efficient and practical means of education, producing that familiarity with the monuments which is the first requisite towards gaining an insight into the study. This system was tried with success at the art circles described above. For the sum of three hundred and fifty dollars, a fine collection of about one thousand good sized photographs could be procured, which should illustrate all art periods, *e. g.:* Assyria, 60 ($35); Egypt, 60 ($35); Greece, 125 ($65); Rome, 100 ($25); Early Christian (Arch. Sculp. Paint.), 100 ($30); Romanesque and Gothic (Arch. Sculp. Paint.), 200 ($50); Renaissance, 150 ($35); Italian Painting, 200 ($60). Such a collection would be in continual use for the illustration of lectures or the inspection of art circles.

Most necessary also for classical archæology—as Dr. Emerson has shown—is a select collection of electrotype reproductions of ancient coins. It would illustrate admirably the history and literature of Greece and her colonies, and often also the condition of art in various provinces at the same

period. The British Museum has, under the direction of Mr. Barclay V. Head, made such a collection of electrotypes divided into chronological and geographical sections. Specimens of the most important of these sections, consisting of a hundred and fifty coins, could be procured for the sum of $125; these would represent chronologically the history of the numismatic art from its beginnings in Greece (c. 700) to the age of Alexander, and geographically, the East, Greece proper, and the West.

A. L. FROTHINGHAM, JR.,
Corresponding Secretary of the
Johns Hopkins Archæological Society.

BALTIMORE, *November*, 1884.

F.

Gifts to the Library from September 1, 1883, to September 1, 1884.

ACLAND, H. W. (Author). Ground-work of Culture. London, 1883. O.

ALLAN, COL. WM. Ceremonies connected with the Inauguration of the Mausoleum of Gen. Robert E. Lee. Lynchburg, 1883. O.

ALLINSON, E. P. (Author). The Study of American Constitutional History. Philadelphia, 1884. O.

ANDRUS, W. R. Report on Railroads of California, 1880–83. 2 vols. O.

ARMSTRONG, W. A. U. S. Commissioner's Report on Railroads, 1881–82. O.

BROTHER AZARIAS. (Author). Culture of the Spiritual Sense. N. Y., 1884. O.

BAKER, J. H. Railroad Reports for State of Minnesota, 1883. O.

BARTLETT, M. T. South Carolina Railroad Commissioner's Report, 1883. O.

BECKER, G. F. (Author). Geology of the Comstock Lode. Washington, 1882. Q.

BILLINGS, J. S., M. D. Index Catalogue, Library of Surgeon-General's Office. Vol. 4. Washington, 1883. Q.

BIRNEY, W. Waite, C. B, History of the Christian Religion to the year 200. Chicago, 1881. O.

Sketch of the Life of James G. Birney. Chicago, 1884. D.

BISHOP, J. Statistics of Labor and Industries, Statistical Bureau, New Jersey, 1878–82. 7 vols. O.

BOUTWELL, F. M. (Author). Old Highways and Landmarks of Groton, Mass. Groton, 1884. O.

BROWN, HON. G. W. A collection of miscellaneous pamphlets.

BROWN, J. L. Report of Auditor of State of Iowa, 1882–83. O.

BROWN, W. H. Pennsylvania R. R. Co. Reports, 1–37. O.

BUTLER, A. P. South Carolina Resources, etc. Charleston, 1883. O.

South Carolina Agricultural Reports. 4 vols. O.

BUZBY, G. L. Philadelphia Board of Trade Report, 1883. O.

CHAMBERLIN, T. C. (Author). Report on the Geology of Wisconsin. 2 vols. O.

CHISHOLM, J. J., M. D. (Author). Manual of Military Surgery. Columbia, S. C. 1864.

Lieber, O. M. Survey of South Carolina. Charleston, 1856. Q.

Tuomey, M. Geology of South Carolina. Charleston, 1848. Q.

CONGREGATIONAL PUBLICATION SOCIETY. Congregational Year Book, 1879–1884. 6 vols. Boston, 1879–84. O.

Minutes of the National Council of the Congregational Churches of the U. S. Boston, 1880–83. O.

CRAFTS, W. A. Report of the Railroad Commissioner of Massachusetts, 1871–78, 1880. 1882–84. 8 vols. O.

DALE, T. N. (Author). Outskirts of Physical Science. Boston, 1884. D.

DIPPOLD, G. T. (Author). Great Epics of Mediæval Germany. Boston, 1882. D.

DIXWELL, GEO. B. (Author). Premises of Free Trade Examined. Cambridge, 1883. O.

DOBBIN, HON. G. W. Backus, I. History of New England. Boston, 1777. D.
A collection of miscellaneous pamphlets.

DODGE, J. H. Report of City Auditor of Boston, 1882–83. O.

DONALDSON, H. H. Nature. London. Vols. 9–29. 28 vols. bound. Q.

DRAPER, L. C. (Author). King's Mountain and its heroes. Cincinnati, 1881. O.

ELY, R. T. Hughes and Neale. Manual for Coöperation. London, 1881.

EWEN BROS. Map showing Cotton Trade and Stocks, 44 × 34. N. Y., 1884.

FARLEY, J. H. Reports of City of Cleveland, 1882. O.

FRAZER, P. (Author). Géologie de la Pennsylvanie. 1882. O.

FREEMAN, E. A. (Author). The Place of Carlisle in English History. O.
The Early History of Sussex.
How the Study of History is Let and Hindered.
English Towns and Districts.
Maccarthy, Rev. E. F. M. The Growth of the English and American Educational Ideals. Birmingham, 1884. O.

FRENCH, HON. T. Report of U. S. Auditor of Railroad Accounts, 1878–80. 2 vols. O.

FROTHINGHAM, A. L. Alunno, F. Le Ricchezze della Lingua Volgare Venice (Aldus) 1551. F.
Phillips, E. New World of Words. London, 1706. F.

FROTHINGHAM, A. L., JR. (Author). L'Omelia di Giacomo di Sarûg sul Battesimo di Constantino Imperatore. Rome, 1883.
Il Tesoro della Basilica di S. Pietro in Vaticano dal XIII al XV Secolo. Rome, 1883.
Une Mosaique Constantinienne inconnue à Saint-Pièrre de Rome. Paris, 1883.

GIBSON, HON. J. City of Kansas Revised Ordinances, 1880. O.

GLEN, F. W. [through Mr. E. R. L. Gould]. Geological and Natural History Survey of Canada. Montreal, 1883. O.
Reports of Government of the Dominion of Canada. 16 vols. O.

GLICK, GOV. G. W. Kansas Public Documents, 1877–82. 3 vols. O.

GOODELL, HON. A. C., JR. (Author). An Account of the Seals of the Colonial and Provincial Courts of Massachusetts, 1680–1780. Cambridge, 1883. O.
Further Notes on the History of Witchcraft in Massachusetts. Cambridge, 1884. O.
Trial and Execution of Mark and Phillis, Slaves of Capt. John Codman, for Petit Treason, in 1750. Cambridge, 1883. O.

GRAY, J. T. Report of Baltimore Police Commissioners, 1882–83. O.

GREEN, HON. S. A. Tucker, W. The Valley of Andorra. Cambridge, 1882. D.
Tucker, W. Republic of San Marino. D.
Tucker, W. Territory of Moresnet. Cambridge, 1882. D.
Boston Board of Health, Eleventh Report. O.

GROSS, C. (Author). Gilda Mercatoria. Göttingen, 1883. O.

GUERNSEY, J. C., M. D. (Editor). History of Homœopathy. Vol. 2. Phila., 1880. O.

HAINES, E. M. (Compiler). A Compilation of the Laws of Illinois relating to Township Organization and Management of County Affairs. Chicago, 1883. O.
(Author). Practical Treatise on the Powers and Duties of Justices of the Peace and Police Magistrates. Chicago, 1884. O.

HARRIS, J. R. Cudworth, Dr. Ralph. Sermon before the House of Commons, March 31, 1647. Cambridge, 1879. D.

HAUGEN, N. P. Reports of Railroads of Wisconsin, 1875, 1877, 1880, 1882. 4 vols. O.

HAYWARD, HON. W. S. Providence Manual, 1883. O.

HEATH, WM. H. Report of the Western House of Refuge. Albany, 1884. O.

HEWITT, F. Auditor's Report Public Accounts, Kentucky, 1878, 1879, 1880–81. 3 vols. O.

HINKS, WM. H. The Centennial Celebration in Frederick Co., Md. Frederick, 1879. O.

HINKLEY, E. O. Tariff for Reduction of Brabant Money to that of France. By Decree of 1810. Antwerp. O.
A collection of law tracts and pamphlets.

HOLDEN, E. S. (Director). Washburne Observatory Publications, I. Madison, 1882. O.

HOLT, H. & Co. New York. (Publishers). Symonds, J. A. Italian By-ways. N. Y., 1883. D.

Habberton, J. George Washington. D.

A Latter-day Saint. N. Y., 1884. D.

Bates, A. The Pagans. N. Y., 1884. D.

"Carmen Sylva" (Queen Elizabeth of Roumania). Pilgrim Sorrow. N. Y., 1884. D.

Winthrop, T. Life and Poems. N. Y., 1884. D.

Conway, H. Called Back. N. Y., 1884. D.

Henkel, F. The Mistress of Ibichstein. N. Y., 1884. D.

Walford, L. B. The Baby's Grandmother. N. Y., 1884. D.

Kapp, T. Life of John Kalb. N. Y., 1884. O.

HOLTON, HON. H. B. Memorial Addresses on Hon. Robert M. A. Hawk, M. C. Washington, 1883. O.

Memorial Addresses on Hon. G. S. Orth, M. C. Washington, 1883. O.

HUGHES, J. S. Morgan, S. T. (Compiler). U. S. Tariff, 1872. Baltimore, 1872. O.

Lodge, E. The Peerage of the British Empire. London, 1847. O.

HULL, J. A. T. Report of Iowa Historical Society, 1883. O.

Historical and Comparative Census of Iowa, 1836–1860. O.

Census Report, Iowa, 1883. O.

Iowa Horticultural Society Report, 1883. O.

INGHAM, W. A. Second Geological Survey of Pennsylvania. 63 vols. O. and Q.

INGLE, E. Morse, J. American Geography. London, 1794. Q.

A Marylander. Letters to Gov. Bradford, 1863. Baltimore, 1863. O.

Journal of the Annual Convention of the Protestant Episcopal Church of the Diocese of Maryland. Baltimore, 1844. O.

JAGEMANN VON, H. C. G. Maetzner. Syntax der Neue-französische Sprache. Berlin, 1843. O.

JAMESON, J. F. (Editor). Records of Amherst, Mass., 1735–1788. Amherst, 1884. O.

JOHNSON, J. W. (Editor). Wyoming: A Record of the Observance commemorative of the Battle and Massacre, July 3, 1778. Wilkesbarre, 1882. O.

KEELING, E. A. Memphis, Trade and Commerce, 1884. O.

KELLY, HON. W. D. Speeches on the Tariff. Washington, 1881. O.

KIMBALL, J. W. (Author). The Christian Ministry. Boston, 1884. D.

KING, H. Centennial Literary Reunion, February 2, 1884. O.

KNOX, HON. J. J. Report of U. S. Comptroller of the Currency, 1883. O.

LABATT, H. I. Spaight's Resources, Soil and Climate of Texas. Galveston, 1882. O.

LANMAN, C. R. (Author). Sanskrit Reader. Boston, 1884. Q.

LIEBER, MRS. FRANCIS. Lieber, F. Legal and Political Hermeneutics. St. Louis, 1880. O.

Ib. Manual of Political Ethics 2 vols. Phila., 1875. O.

Ib. On Civil Liberty and Self-Government. Phila., 1874. O.

Ib. Miscellaneous Writings. Phila., 1881. 2 vols. O.

Ib. Ueber Bürgerliche Freiheit und Selbstverwaltung. Heidelberg, 1860. O.

Bastiat's Sophisms of the Protective Policy. N. Y., 1848. D.

With many pamphlets and manuscripts.

LORING, G. B. U. S. Commissioner's Report on Agriculture, 1883. O.

LOW, HON. S. Brooklyn City Reports, 1881. O.

LUSKEY, H. Labor Statistics, Ohio, 1878–79, 1881–82. 4 vols. O.

MARTIN, H. N. (Author). The Human Body. New York, 1883. D.

MARYLAND HISTORICAL SOCIETY. Maryland Archives, Vol. I. Baltimore, 1883. Q.

MAURICE, COL. J. F. (Author). Hostilities without a Declaration of War. London, 1883. O.

McDONALD, J. S. New Jersey Archives, First Series, Vol. 5–7. Newark, 1882. O.

MILLER, W. H. Report of the Kansas City Board of Trade, 1884. O.

MORRIS, G. S. E. Wallace. Aristotle's Philosophy. Oxford, 1880. O.

MUNROE, J. E. (Author). The Study of Law in Greece, Rome, and England. (A Lecture at Owen's College, 1882.) D.

NEILL, REV. E. D. Records of the Virginia Company. Founders of Maryland. Historical Pamphlets.

NEWLANDS, J. A. R. (Author). Periodic Law. London, 1884. D.

NEWMAN, J. W. Ohio Statistical Report, 1883. O.

Ohio Agricultural Report, 1882. O.

PATO, B. [through the Royal Academy of Lisbon]. (Translator). Shakespeare, Hamlet, and Merchant of Venice. Portuguese translation. O.

PATTISON, GOV. R. E. Pennsylvania Laws, 1870-72, 1878-79, 1881-82. 7 vols. O.

PEELE, W. A. Report of Bureau of Statistics, Indiana, 1882-84. 3 vols. O.

PENDLETON, C. Phila. Public Education Association Report, 1883. O.

Phila. Club Publications.

PERKINS, HON. S. C. 14 Boxes American Newspapers, representing the History of the Civil War.

Documents relating to the Public Buildings of Philadelphia. O.

Jones, A. Instruction in Political Science in Schools below the College. Providence, 1882. O.

PHILLIPS, H. JR. A Collection of Monographs on Archæological Subjects.

PROUD, J. G., JR. Williams, J. S. Invasion and Capture of Washington. N. Y., 1857. D.

Treaty with Great Britain, 1775. Phila., 1795. O.

Washington, G. Letters on Husbandry. Alexandria, 1803. O.

D'Ivernois, F. View of Geneva. Dublin, 1784. O.

Cobbett, R. Political Register, Vol. 28. London, 1815. O.

Stearns, E. Notes on "Uncle Tom's Cabin." Phila., 1853. D.

Seabury, S. American Slavery. N. Y., 1861. D.

Gibbon, E. Decline and Fall of the Roman Empire. 8 vols. Phila., 1804. D.

Guthrie, W. Geography. 2 vols. Phila., 1794. Q.

Moultrie, W. (Gen.) Memoirs of the American Revolution. 2 vols. N. Y., 1802. D.

Edinburgh Annual Register. 10 vols. O.

PUTNAM'S SONS, G. P. (Publishers). McAdam, G. An Alphabet in Finance. N. Y., 1883. D.

Barnard, C. Coöperation as a Business. N. Y., 1881. D.

Handbook for Hospitals. N. Y., 1883. D.

Handbook for Visitors among the Poor. N. Y., 1877, 1883. D.

Sumner, W. G. Protection in the U. S. N. Y., 1883. O.

Spaulding, M. C. Handbook of Statistics in the U. S. N. Y., 1883. D.

Sturtevant, J. M. Economics. N. Y., 1883. D.

Manson, G. J. Work for Women. N. Y., 1883. D.

Rogers, J. E. T. Social Economy. N. Y., 1883. D.

Adams, C. F. Notes on Railroad Accidents. N. Y., 1879. D.

Hughes, R. N. The Currency Question. N. Y., 1879. D.

Directory to Charitable Societies of New York. N. Y., 1884. D.

Schoenhof, J. The Destructive Influence of the Tariff upon Manufactures and Commerce. N. Y., 1883. D.

RAMAGE, B. J. Massachusetts Laws. (Reign of William and Mary.) Q.

RANSOM, W. C. Reports on Railroads of Michigan, 1883. O.

RAWLE, W. B. Reprint of F. Rawle's "Ways and Means for Delaware to Become Rich." (Phila., 1725). Phila., 1878.

REYER, E. (Author). Physik der Eruptionen. Wien, 1877. O.

ROGGEN, E. P. Report of Secretary of State of Nebraska, 1883. O.

ROMEIS, HON. J. Annual Report of City of Toledo, 1882. O.

SCULL, G. D. (Author). Dorothea Scott. Oxford, 1883. O.

SHEPHERD, H. E. (Author). An Historical Reader. N. Y., 1884. D.

SHUFELDT, R. W. (Author). Anatomy of Birds. Washington, 1882. O.

SPOFFORD, A. R., Librarian of Congress. Margry, P. Découvertes des Français dans l'Amerique. 4 vols. Paris, 1875. O.

STEEL, W. B. Greenleaf on Evidence. 3 vols. Boston, 1876. O.

Stephen on Pleading. Phila., 1867. O.

STILLMAN, W. J. (Author). The Cretan Insurrection. New York, 1874. D.

STUBBS, W. (Author). Two Lectures on the History of the Canon Law in England.
SWEET, E. Report on New York Canals, for 1872, 1874, 1880-83. 6 vols. O.
New York State Engineer's Report, 1871, 1873-75, 1877, 1879, 1881-83. 11 vols. O.
New York Report on Transportation of Freight, 1884. O.
TARBOX, J. R. Fire and Life Insurance Reports, Massachusetts, 1881-84. 7 vols. O.
TELLER, HON. H. M. United States Statistics of Population, 1880. Q.
THEOBALD, S., M. D. (Author.) Some Recent Theories Regarding the Pathogeny of Sympathetic Ophthalmia, viewed from a Microscopic Standpoint. 1884. O.
THOMAS, W. J. Raymond, D. The Elements of Constitutional Law and of Political Economy. Baltimore, 1840. D.
THOMPSON, H. O. Reports on Public Works, New York City, 1879-83. 3 vols. O.
TURNER, J. F. Comptroller's Report of Treasury Department of Maryland. Annapolis, 1875, 1877, 1879-81, 1883. O.
WALLACE, J. W. (Author). Col. Wm. Bradford, Memoir. Phila., 1884. O.
WATKINSON, R. C. (Author). George B. Emerson. Cambridge, 1884.
WHARTON, PROFESSOR FRANCIS. (Author). Commentaries on American Law. Phila., 1884. O.
WHITE, PRESIDENT A. D. (Author). Several Historical Lectures and Addresses.
Address at the Funeral of Edward Lasker.
Paper Money Inflation in France. N. Y., 1879. O.
Political Education. 1878. O.
WHITMORE, HON. W. H. Report of the Commissioner of Records of Boston, 1630-99. Boston, 1883. O.
WILLIAMS, E. Insurance Reports of Connecticut, 1872-84. 16 vols. O.
WISCONSIN, STATE OF. Historical Collections. Vol. 9. O.
WILSON, G. Report of the New York Chamber of Commerce, 1881-82. O.
WINTHROP, R. C. (Author). Centennial Oration at Yorktown. Boston, 1881. O.
WOOD, W. & Co. Brown, Goold. Grammar of English Grammars. New York, 1882. O.
WRIGHT, C. D. Uniform Hours of Labor. Boston, 1881. O.
Intemperance and Crime. Boston, 1881. O.
Labor Statistics of Massachusetts. Fifth Seventh, Tenth, Thirteenth, Fourteenth, 1874, 1876, 1879, 1882, 1883. 5 vols. O.
Report to the National Convention of State Bureaus of Statistics of Labor, September, 1883. O.
WYMAN, W., M. D. (Author). Quarantine. Baltimore, 1844. O.

Also, from various official sources, U. S. Reports and other Government Publications; Publications of the Smithsonian Institution; Official documents of various States and Cities.

PROFESSOR JAMES BRYCE, M. P., has presented to the library of the University a valuable collection of parliamentary documents of the last session, including Reports of the Irish Land Commission, the Government correspondence concerning affairs in South Africa, and the texts of Bills introduced into the House of Commons, 1883-4, etc.

G.

List of Foreign Exchanges.

The following list gives the names of the foreign societies and journals with which regular exchanges of publications have been made by the university during the year.

GERMANY AND AUSTRIA.

Berlin. Königliche akademie der wissenschaften.
Deutsche chemische gesellschaft.
Jahrbuch über die fortschritte der mathematik.
Journal für reine und angewandte mathematik. (Crelle.)
Der naturforscher.
Vierteljahrschrift für volkswirtschaft, etc.
Zeitschrift für deutsches alterthum.
Zeitschrift für völkerpsychologie und sprachwissenschaft.
Braunschweig. Akademische blätter.
Archiv für das studium der neueren sprachen.
Cassel. Verein für naturkunde.
Cöthen. Chemiker zeitung.
Giessen. Jahresbericht über die chemie und physik.
Zeitschrift f. alttestamentl. wissenschaft.
Gotha. Zeitschrift für kirchengeschichte.
Göttingen. Königliche gesellschaft der wissenschaften.
Beiträge zur kunde der indogermanischen sprachen.
Halle. Beiträge zur geschichte der deutschen sprache.
Heidelberg. Naturhistorisch-medicinische verein.
Heilbronn. Englische studien.
Literaturblatt f. german. und roman. philologie.
Jena. Jenaische zeitschrift für naturwissenschaften.
Kiel. University of.
Astronomische nachrichten.
Leipzig. K. Sächsische gesellschaft der wissenschaften.
Archiv der mathematik und physik. (Grunert.)
Archiv für lateinische lexikographie.
Jahrbücher für classische philologie.
Liebig's annalen der chemie. (Wöhler, Kopp.)
Literaturblatt für orientalische philologie.
Mathematische annalen. (Clebsch.)
Unsere zeit.
Wochenschrift für klassische philologie.
Zeitschrift für mathematik und physik. (Schlömilch.)
Zeitschrift für krystallographie und mineralogie.
Zeitschrift für allgemeine sprachwissenschaft.
Zeitschrift für neu-französische sprache.
Zeitschrift für keilschriftforschung.
Zoologischer anzeiger.
Mainz. Concordia.
Marburg. Jahresbericht u. d. fortschr. d. chemie.
Munich. Königliche akademie der wissenschaften.
Strassburg. Zeitschrift für physiologische chemie.

Stuttgart. Finanz archiv.
Trieste. Κλείω.
Tübingen. Jahresbericht für reine chemie.
Vienna. K.-k. akademie der wissenschaften.
Ornithologische verein.
K.-k. geologische reichsanstalt.
Weisbaden. Zeitschrift für analytische chemie. (Fresenius.)
Würzburg. Medicinische facultät.

FRANCE AND SWITZERLAND.

Cherbourg. Société nationale des sciences naturelles et mathématiques.
Paris. Institut de France: Académie des sciences.
Association pour l'encouragement des études grecques.
Bureau des longitudes.
École normale supérieure.
École polytechnique.
Observatoire de Paris.
Société chimique de Paris.
Société historique.
Société mathématique de France.
Société de legislation comparée.
Société de l'histoire du protestantisme francais.
Annales de chimie et de physique.
L'astronomie.
Bulletin des sciences mathématiques et astronomiques.
Bulletin des antiquites africaines.
Journal Asiatique.
Journal de mathématiques pures et appliquées.
Moniteur scientifique.
Nouvelles annales de mathématique.
Reforme sociale.
Revue de chefs-d'œuvre.
Revue internationale de l'enseignement.
Revue linguistique.
Revue politique et littéraire.
Revue scientifique.
Roscoff. Laboratoire de zoologie expérimentelle.

Bern. Schweiz. gesellsch. für die gesammten naturwissenschaften.
Zurich. Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

Amsterdam. K. akademie van wetenschappen.
Brussels. Académie des sciences de belgique.
Musée royal d'histoire naturelle.
Annales du bibliophile.
Ghent. Mathésis.
Archives de biologie.
Harlem. Musée Teyler.
Leyden. Nederlandische dierkundige vereeniging.
Récueil des travaux chimiques des Pays-Bas.
Liége. Société royale des sciences.
Louvain. Le muséon.

Italy; Spain; Portugal.

Catania. Società tecnica.
Florence. Rivista scientifica industriale.
Milan. Istituto Lombardo di scienze e lettere.
Annali di matematica pura ed applicata.
Archivio storico lombardo.
Naples. Giornale di mathematiche.
Zoologische station zu Neapel.
Palermo. Gazzetta chimica Italiana.
Rome. Reale accademia dei Lincei.
Comitato geologico d'Italia.
Bulletino di archaeologia Cristiania.
Commissione archaeologica communale.
Società romana di storia patria.
La cultura.
Turin. Reale accademia delle scienze.
Archives Italiennes de biologie.
Archivio di psichiatria, scienze penali, etc.
Rivista di chimica medica.
Rivista storica Italiana.
Observatoria.
Venice. Reale istituto Veneto.

Coimbra. Jornal de sciencias mathematicas e astronomicas.
Lisbon. Academia real das sciencias.
Sociedad de geographia.
Madrid. Industria ibérica.

Great Britain and Ireland.

Birmingham. Philosophical society.
Cambridge. Philosophical society.
Philological society.
Dublin. Royal Irish academy.
Trinity college.
Edinburgh. Royal society.
London. Royal society.
Royal astronomical society.
Royal microscopical society.
Royal institution of Great Britain.
Chemical society.
Crystallogical society.
Mathematical society.
Mineralogical society.
Philological society.
Science and art department, South Kensington.
Society of biblical archaeology.
Society of telegraph engineers.
Society of chemical industry.
Analyst.
Antiquarian magazine.
Brain.
Chemical news.
Christian socialist.
Journal of conchology.
Journal of education.

London. Journal of hellenic studies.
Macmillan's magazine.
Palestine exploration fund.
The month.
Manchester. The Owens College.

DENMARK, SWEDEN AND NORWAY; RUSSIA AND FINLAND.

Bergen. Museum.
Copenhagen. Royal academy.
Tidsskrift for mathematik.
Nordisk tidsskrift for philologie.
Christiania. Archiv for mathematik og naturvidenskab.
University of Christiania, publications.
Norwegische commission der gradmessung.
Nyt magasin for naturvidenskaberne.
Stockholm. Royal Swedish academy of sciences.
Acta mathematica.
Hogskola.
Physiological laboratory of university.
Geologische föreningen i Stockholm.

St. Petersburg. Académie impériale des sciences.
Russian chemical society.
Moscow. Société impériale des naturalistes.
Helsingfors. Société des sciences de la Finlande.

BRITISH INDIA.

Calcutta. Asiatic society of Bengal.
Ambula. Panjab notes and queries.
Kandy. The orientalist.

SYRIA.

Beyrout. Muktataf.

JAPAN.

Tokio. University, publications of scientific department.
Seismological society of Japan.

AUSTRALIA AND NEW ZEALAND.

Sydney. Royal society of New South Wales.
Adelaide. Royal society of South Australia.
Wellington. Colonial museum.
New Zealand institute.
Geological survey.

MEXICO.

Mexico. Revista cientifica Mexicana.
Observatorio.

SOUTH AMERICA.

Rio de Janeiro. Observatoire impériale.
Cordoba. Academia nacional de ciencias.
Quito. Anales de la universidad.

CANADA.

Montreal. Royal society of Canada.
Canadian naturalist.
Ottawa. Geological survey of Canada.

H.

Description of new Buildings.

BIOLOGICAL LABORATORY.

The recently opened biological laboratory of the Johns Hopkins University is eighty-four by fifty-two feet in external measurement, and consists of three stories and a basement. It is built of Baltimore pressed brick; with steps, entry, window sills, and band-courses of Cheat-river bluestone. A fact that at once attracts attention is the number and large size of the windows; as the laboratory is free on all sides, it is therefore very well lighted.

On ascending the front steps, and passing through the door, the visitor enters the main hall, from which a wide staircase ascends to the third story, and on which most of the rooms of the first floor open. This floor is given up to the regular class-instruction of students not engaged in special work. It has on it a lecture-room with seats for sixty; a storeroom connected with this, for the keeping of diagrams and lecture-apparatus; an administration-room, the headquarters of the chief assistant; a preparation-room containing a supply of the reagents, specimens and material required for the daily practical class-work; and the large general laboratory, thirty-two by forty-eight feet.

The latter has windows on three sides. Around these sides runs a work-table, supported, independently of the floor, on brackets attached to the walls, and affording ample space for thirty students. If necessary, a second table can be set inside this, giving places for fifteen or twenty more. The centre of the room is in part occupied by a dissecting and a chemical table. The latter is supplied with the reagents and appliances for practical work in elementary chemical physiology. The dissecting table has a slate top, and is provided with a sink and water-tap between every two students. The inner side of the room has, against the wall, tables for scales and the warm-water oven; a large hood for the performance of chemical operations calculated to give rise to noxious vapors; and a dumb-waiter leading to the basement, on which articles can be sent up from the storerooms there when called for. Near the centre of the room is a chute, lined with plate-glass (so as to be readily kept clean), and passing direct to the furnace-room below. Through this chute all refuse is at once got rid of. The floor of this room, and of several others in the building, is of asphalt, and the walls of hard cement to a height of two and a half feet. Thus the floor can be flooded with water, and thoroughly cleansed whenever desirable.

The work to be done in this room annually is as follows; by the first-year students, a thorough macroscopic and microscopic examination of about

twenty-five selected vegetable and animal organisms illustrative of the course of lectures on general biology, and a study of the embryology of the chick; by second-year students, a course in practical animal physiology and histology a little more extended than that given in Foster and Langley's 'Practical Physiology.'

The second floor contains the following rooms: a laboratory for research and advanced study in animal morphology, and a corresponding room for botanical work (used at present as the laboratory of psycho-physiology); a photographing-chamber, with heliostat and other appliances for micro-photography; a library of biological text-books, monographs, and journals; a small lecture-room, capable of seating about thirty; an assistant's private room; a museum containing such typical osteological and other specimens as are needed by students pursuing the regular courses of class-instruction, and the beginning of a collection of the local fauna and flora, made by the members of the field-club; and a store and preparation room for the curator of the museum.

The third floor is mainly given up to advanced students in physiology and histology. It has three large work-rooms; a dark chamber for spectroscopic work, for experiments in physiological optics, etc.; the director's private room; a room for the myograph; an assistant's private room; the mechanics' shop, for the construction and repair of instruments; and a small balance-room.

The building being heated by steam supplied from a boiler in the neighboring chemical laboratory, the basement, which is well lighted, is left free for use. The scientific work-rooms in it are a large, well-equipped room for advanced study in chemical physiology, a balance-room, and a room for the study of animal electricity. The basement also contains a suite of three rooms, which form the janitor's headquarters where he has charge of the necessary stock of chemicals and glassware, and has also a carpenter's bench, at which he does any simple bit of carpentering required. From one of these rooms a shaft two feet square runs to the top of the building, communicating with each floor. Through this shaft it is intended to run wires to various work-rooms, transmitting electrical currents for the running of chronographs, and for similar purposes. The shaft was also planned in the hope that ultimately the clock-work of kymographs and such instruments will be replaced by electrical energy generated by an engine and dynamo in the basement, and distributed thence over the building. The remaining rooms in the basement are, the "animal room," fitted up with tanks for the keeping of frogs, terrapins, and so forth; and the furnace-room. The latter contains a cremation-furnace, in which all the combustible *débris* of the laboratory is disposed of, and a boiler and condenser for the preparation of distilled water; it has also in it a small steam-engine, designed to be used for running a centrifugal apparatus.

Diagrams Showing the Arrangement of Rooms.

FIRST FLOOR.

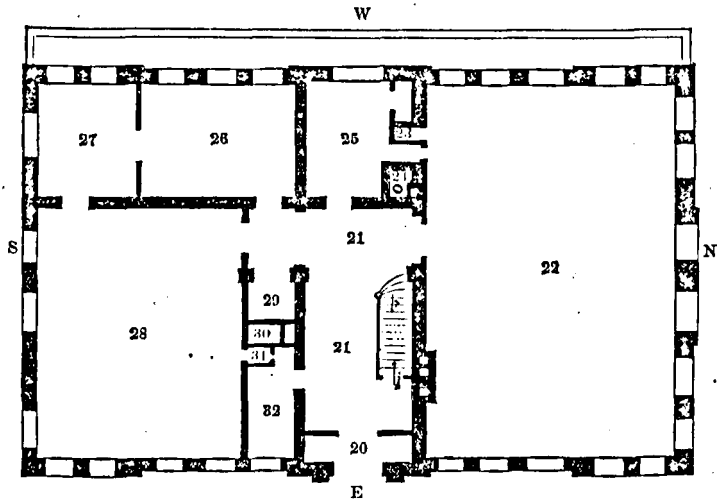


Figure 1.—20, vestibule; 21, main hall; 22, work-room for practical instruction of less advanced students; 24, 30, ventilating shafts; 25, storeroom of materials and reagents for general practical class-work; 26, chief assistant's room; 27, storeroom for diagrams and lecture-apparatus; 28, lecture-room; 29, elevator; 32, cloak-room.

SECOND FLOOR.

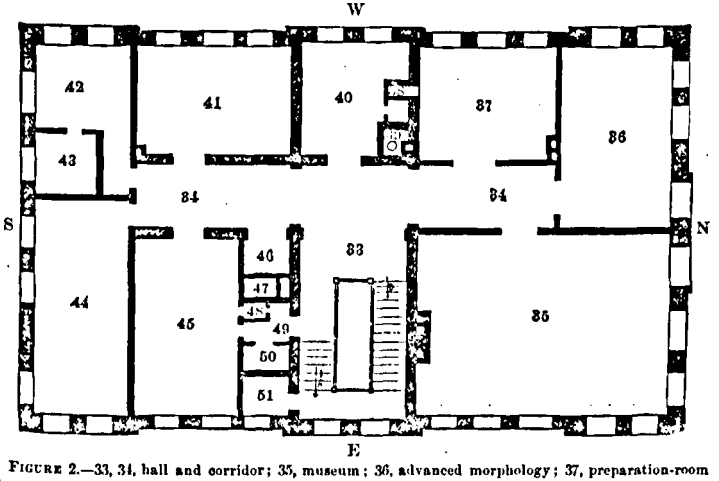


Figure 2.—33, 34, hall and corridor; 35, museum; 36, advanced morphology; 37, preparation-room for museum; 40, assistant's room; 41, library; 42, 43, photography; 44, advanced botany; 45, lecture-room; 46, elevator; 47, 39, ventilating shafts; 51, lavatory.

THIRD FLOOR.

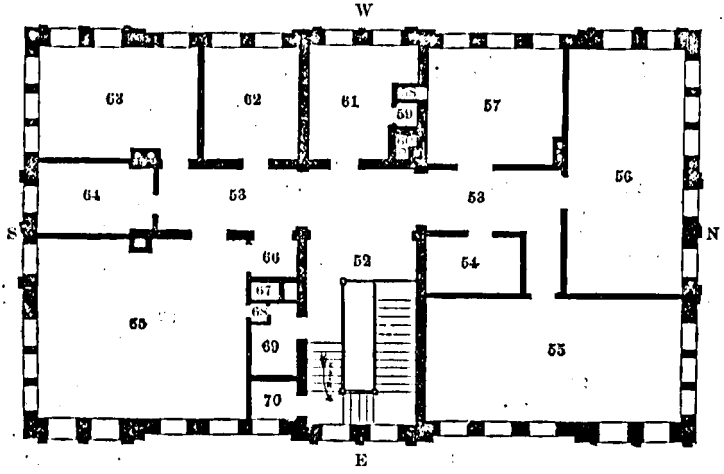


FIGURE 3.—52, 53, hall and corridor; 55, experimental physiology; 56, advanced histology; 57, workshop; 54, balance-room; 61, assistant's room; 62, myograph-room; 63, director's private room; 64, dark chamber; 65, experimental physiology; 66, elevator; 60, 67, ventilating shafts; 69, closet; 70 lavatory.

BASEMENT.

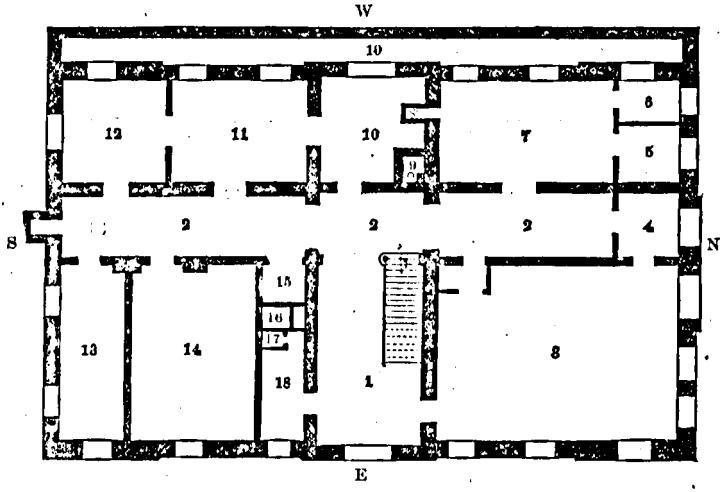


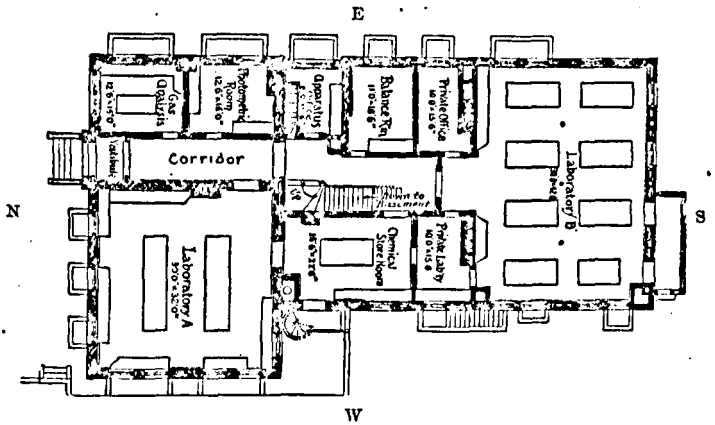
FIGURE 4.—1, 2, entrance and corridor; 3, chemical physiology; 4, balance-room; 7, furnace-room; 10, 11, 12, janitor's store and battery rooms; 13, animal-room; 14, electro-physiology; 15, elevator; 16, 9, ventilating shafts; 18, lavatory.

CHEMICAL LABORATORY.

The original laboratory for Chemistry was built in the expectation that it would be large enough for a period of five years. At the end of that time there was not room for all who wished to avail themselves of its privileges, and consequently the Trustees, in June, 1882, decided to enlarge it. Plans were accordingly drawn and contracts made, and on the third of May, 1883, the building in its improved and extended form was completed and thrown open to public observation. It now covers an area of about fifty by one hundred feet and has three full stories and a basement. In the basement are the necessary conveniences for assaying and other furnace operations; on the first floor there are large rooms devoted mainly to qualitative and quantitative analysis; on the second, are rooms for research, for the study of the director, the library, and for lectures in General Chemistry. On the third floor are rooms for the chemical and mineralogical collections, a working and lecture-room for mineralogy, and a second lecture-room for chemistry. The entire laboratory will conveniently accommodate about ninety working students.

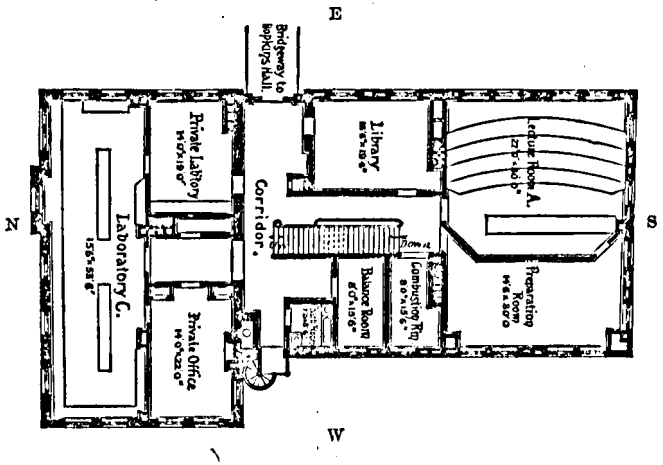
DIAGRAMS SHOWING THE ARRANGEMENT OF ROOMS.

FIRST FLOOR.



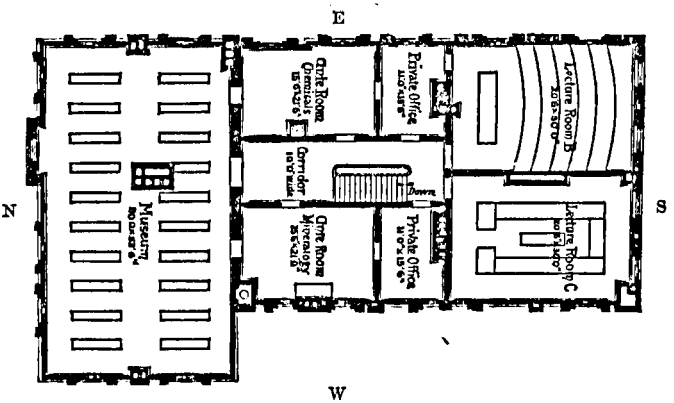
The first floor is devoted mainly to such work as is commonly carried on in chemical laboratories. Laboratory A (measuring 30 by 32 feet), is intended especially for those who are beginning the study of chemistry; and Laboratory B (measuring 30 by 42 feet), for more advanced students, who are engaged in quantitative analysis and in making difficult preparations.

SECOND FLOOR.

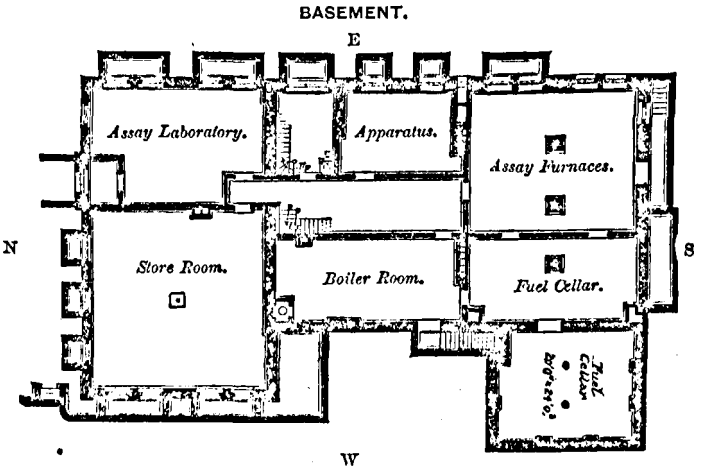


The advanced work is carried on in the second floor. Laboratory C (measuring 15.6 by 53.6 feet, and cased with enamelled bricks), is used as the research laboratory. The principal lecture room and the Chemical library as well as the Director's rooms, are also on this floor.

THIRD FLOOR.



The principal room on the third floor (30 by 53.6 feet, in extent) is intended for a cabinet of chemical substances, including examples of industrial processes and results. At present this room also contains a good working collection of minerals. There are also two smaller lecture rooms, one of which is conveniently arranged for instruction in mineralogy.



The basement contains store rooms for chemical apparatus, two well lighted rooms for assay work d other furnace operations; besides the boiler room and fuel vaults.

THE GYMNASIUM.

The Gymnasium has been planned to meet the requirements of two hundred and fifty persons, and especial pains have been taken to secure an abundance of light and air in the main hall, and the dressing rooms connected with it.

The ground plan of the building in which the gymnasium and dressing rooms are contained resembles in shape a letter L turned thus ⌐. The main building of the ⌐ abutting on Garden street is 104 feet in length, includes the gymnasium proper and a vestibule, and the wing of the ⌐ extending from Garden street to the rear of Bentley Hall is nearly 85 feet in length. The entrance to the building is on Garden street at the junction of the main building and the wing of the ⌐. The entrance is through a vestibule, out of which, upon the first floor, doors open into the main hall and into the private dressing rooms, while on the second floor at the head of a flight of steps, is the door of the Director's rooms, in which the physical examinations are made and recorded. The vestibule and gymnasium hall are in the new building; while the dressing and bath rooms, and the offices of the Director are in the wing.

The main hall comprises a single room, open to the roof, and has a total height from floor to ridge pole of 43 feet. It has upwards of 3400 square feet of flooring; its walls, of painted brick, are 25 feet high and 18 inches thick; and each of its side walls contains seven high and wide windows whose sills are seven feet from the floor.

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ISSUED November 26, 1884.

TENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

JOHNS HOPKINS UNIVERSITY

Baltimore, Maryland

1885

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Léonce Rabillon, Bach. ès Lett., . . *Lecturer on French Literature.*

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Maurice Bloomfield, Ph. D., . . . *Associate Professor of Sanskrit.*
William K. Brooks, Ph. D., . . . *Associate Professor of Morphology.*
Thomas Craig, Ph. D., . . *Associate Professor of Applied Mathematics.*
A. Marshall Elliott, A. M., . *Associate Professor of the Romance Languages.*
Harmon N. Morse, Ph. D., . . . *Associate Professor of Chemistry.*
William E. Story, Ph. D., . . . *Associate Professor of Mathematics.*
Minton Warren, Ph. D., ... *Associate Professor of Latin.*
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William T. Councilman, M. D., ... *Associate in Pathology.*
Richard T. Ely, Ph. D., . . . *Associate in Political Economy.*
Fabian Franklin, Ph. D., ... *Associate in Mathematics.*
Edward M. Hartwell, M. D., Ph. D., . . *Associate in Physical Training.*
William H. Howell, Ph. D., ... *Associate in Biology.*
J. Franklin Jameson, Ph. D., ... *Associate in History.*
Arthur L. Kimball, Ph. D., ... *Associate in Physics.*
Henry A. Todd, Ph. D., . . . *Associate in Romance Languages.*
Philip R. Uhler, ... *Associate in Natural History.*

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Henry H. Donaldson, Ph. D., ... *Instructor in Psychology.*
Julius Goebel, Ph. D., ... *Instructor in German.*
George Hempl, A. B., ... *Instructor in German.*
J. P. McMurrich, Ph. D., ... *Instructor in Osteology, etc.*
Edward H. Spieker, Ph. D., . . . *Instructor in Latin and Greek.*
Charles A. Perkins, Ph. D., ... *Assistant in Physics.*
Edmund Renouf, Ph. D., ... *Assistant in Chemistry.*
Hugh Newell, ... *Instructor in Drawing.*
Charles L. Woodworth, Jr., ... *Instructor in Elocution.*

TENTH ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore, Maryland

1885

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PUBLICATION AGENCY OF THE JOHNS HOPKINS UNIVERSITY
1885

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TENTH ANNUAL REPORT.

To the Trustees of the Johns Hopkins University:

I have the honor of submitting the tenth annual report of the progress of the Johns Hopkins University, which covers the ninth year of instruction and closes September 1, 1885. So much detailed information is now given in the Circulars which are published several times during the academic year, that the annual reports will doubtless be more and more regarded as convenient summaries of what has already been made known, and not as the original announcement of official actions.

The year has been one of quiet and satisfactory work without any fundamental changes in our methods or in our buildings. A full account is given, in the appendix, of all courses and classes.

THE GROUP SYSTEM OF UNDERGRADUATE STUDIES.

The Annual Register, published in June last, was thoroughly revised so as to make its state-

ments, which are of necessity complex, more easily intelligible, and especially to bring out more distinctly than hitherto the arrangement of undergraduate studies in parallel "Groups," each of which leads to the Bachelor's degree. Much thought has been given during the year to an application of the "Group" idea to those advanced courses which lead to the degree of Doctor of Philosophy; and a trial scheme has been prepared by the Board of University Studies, suggesting as judicious certain combinations of subjects in which instruction is here provided.

In a good system of collegiate education, there are always two forces at work, freedom and authority, both of which are important for the attainment of the highest results in mental development. Without spontaneous exertions on the part of the scholar in the pursuit of knowledge higher instruction is difficult, mechanical, and comparatively unfruitful; on the other hand the progress of a scholar, who is not guided by a qualified teacher, is in danger of being slow, blundering, and rambling. The problem which always perplexes college faculties, and also individual parents, teachers, and pupils, is the adjustment of these two forces so that the resultant motion shall be in the right direction, with the least possible loss of energy. The problem has grown more and more difficult during the last quarter of a century. Science has

made its great advances; modern languages have asserted their importance; the domain of classical instruction has been widened; history and political science have been recognized as of great educational value. Moreover, the pecuniary resources of American colleges have been enlarged, and the number of teachers, each desirous of enforcing the value of his own pursuits, has been greatly increased. It is not surprising therefore that the old "curriculum," as it is termed, has been esssentially modified in most of the larger colleges of this country, and that "electives" are more and more allowed. These new and perplexing conditions have been recognized in this university since its foundation, and the experience of several years has confirmed the plans originally adopted. In place of a single curriculum, and instead of no curriculum, several parallel curricula have been arranged, which are assumed to be equally honorable, liberal and difficult, and which therefore lead to the same degree of Bachelor of Arts. They all include the study of (*a*) language and literature, (*b*) mathematics and other exact sciences, (*c*) historical and moral science, but the proportions of the different studies vary. Seven schedules are announced upon the Register, one of which must be chosen by every undergraduate who wishes to proceed to the Bachelor's degree. Certain studies are common to all these courses, that

is to say, must be taken up by every undergraduate. Besides giving evidence of a good English education, the student before his matriculation, must pass an examination in Latin and Mathematics, and also in Greek, unless he distinctly gives up the classical course, in which case he may offer German and French as a substitute. Whatever course he afterwards follows must include physical geography, history and the critical study of English; logic, ethics and psychology; the continued study of modern languages; at least a year in some scientific course connected with laboratory work; together with physical and vocal culture, and drawing. In addition to these studies he must devote his attention daily for two years to two comprehensive courses (such as Greek and Latin, or chemistry and physics, or Latin and mathematics, or modern languages, etc.), which will develop the tendency of his intellectual life. The seven groups, for which, in accordance with these principles, arrangements are now made, are these:—

1. Classical,—corresponding closely with what has been hitherto known in this country as the usual college course;

2. Mathematical-Physical,—which meets the wants of those who are expecting to enter upon the modern vocations in which rigid mathematical discipline is indispensable;

3. Chemical-Biological,—which is adapted to those, among others, who expect to enter upon the subsequent study of medicine;

4. Physical-Chemical,—which is most likely to be followed by students preparing for those scientific pursuits which are neither chiefly mathematical nor chiefly biological;

5. Latin-Mathematical,—which affords a good fundamental training, without prolonged attention to the study of Greek;

6. Historical-Political,—which furnishes a basis for the subsequent study of law;

7. Modern Language,—where French, German, English, and in exceptional cases, other modern languages, take the place of Latin and Greek in the traditional classical course.

New Buildings.

Near the close of last year's session, plans were drawn for the construction of a Physical Laboratory on the site at the corner of Monument and Garden streets. The building will go rapidly forward and the contract provides for its completion September 1, 1886. This action of the Trustees will furnish much-needed relief to an important part of the university. The literary departments next require improved and enlarged rooms, for the accommodations now provided for them are inadequate and inconvenient. It should be borne in mind that the

number of students and of classes has rapidly increased, so that rooms which served us well enough at first are quite too restricted for our present necessities. The aggregate attendance has nearly doubled in the last five years. In History there are one hundred and nine scholars, in German one hundred and seven, in Latin sixty-four, and although these companies never meet as one class, yet they require a large amount of space. The library and the various subordinate collections of books for seminary use likewise occupy a great deal of room; so that the time is clearly at hand for the construction of an academical building adapted to literary in distinction from scientific work. We also want much better rooms for public assemblies. I cannot but hope that some friend of this university, some man of wealth who loves the place of his nativity or residence, and who desires to contribute toward the education of youth under most favorable circumstances, will offer to provide such a hall as we so much need. In Cornell University are separate halls which bear the names of McGraw, Sibley, and Sage; at Cambridge, New Haven, and Princeton, liberal gifts for buildings have frequently been made within the last few years; and I believe the day will surely come when a like spirit of liberality will be rendered to this foundation. It cannot come too soon.

Numerical Statements.

The academic staff included during the year fifty-two teachers, five of whom were non-resident lecturers. The number of students enrolled during the year was two hundred and ninety, of whom one hundred and thirty were residents of Maryland, and one hundred and forty-five came here from thirty-two other States of the Union, and fifteen from foreign countries. Among the students were one hundred and seventy-four already graduated, coming from ninety-five colleges and universities; there were sixty-nine matriculates (or candidates for the degree of Bachelor of Arts); and there were forty-seven admitted as special students, to pursue courses of study for which they seemed fitted, without reference to possible graduation. The attendance upon the public lectures (not including those in French) averaged two hundred and twelve.

Nine young men have been admitted to the degree of Bachelor of Arts, and thirteen have been promoted to that of Doctor of Philosophy—making in all twenty-two graduates. Since degrees were first conferred, in 1878, eighty-eight persons have attained the Baccalaureate degree, and sixty-seven have been promoted to the degree of Doctor of Philosophy.

The following table indicates the enrolment of students in each year since the university was opened in the autumn of 1876:—

	Graduates, (incl. Fellows.)	Matriculates.	Non-Matriculates.	Total Enrolled.	Average Attendance at Public Lectures.
1876–77	54	12	23	89	60
1877–78	58	24	22	104	84
1878–79	63	25	35	123	96
1879–80	79	32	48	159	113
1880–81	102	37	37	176	186
1881–82	99	45	31	175	137
1882–83	125	49	30	204	148
1883–84	159	53	37	249	122
1884–85	174	69	47	290	212

The attendance upon some of the principal courses during the last five years has been as follows:

	1880–81.	1881–82.	1882–83.	1883–84.	1884–85.
Mathematics, ...	31	33	35	37	75
Physics, ...	35	42	50	56	80
Chemistry, ...	40	44	49	51	76
Mineralogy, ...					41
Biology, ...	25	32	30	47	44
Greek, ...	31	33	44	41	41
Latin, ...	40	39	41	48	64
Sanskrit, etc., ...	*	6	8	10	25
Shemitic Languages, . .	*	*	*	13	13
German, ...	55	47	50	63	107
French, Italian, etc., . .	33	26	31	31	63
English, ...	29	22	45	50	68
History and Political Science, ...	40	40	64	88	109
Psychology, Ethics, etc., .	14	22	47	28	44

*Not recorded.

During nine years, eight hundred individuals have been enrolled as students, of whom three

hundred and eighty-six have come from Maryland, (including three hundred and eight from Baltimore), and four hundred and fourteen from forty-seven other States and countries. Of this number four hundred and seventy-four persons pursued courses as graduate students, and three hundred and twenty-six as collegiate students.

Sir William Thomson's Lectures.

Reference was made a year ago to the lectures which were given here in October, 1884, by Sir William Thomson, D. C. L., F. R. S., etc., Professor in the University of Glasgow. This was one of the most remarkable courses ever given in this university, whether the eminence of the lecturer be considered and the freshness and scope of his thoughts, or the intellectual character of the auditors who followed him. Most of his hearers were professors and teachers of physics, and many of them came from a long distance at a very considerable sacrifice. The subject was announced under the general term "Molecular Dynamics," and the treatment was confined to the Wave Theory of Light, largely dealing with the difficulties of the theory. A nearly *verbatim* report of what was said was published by the university, with the author's consent, soon after the lectures closed. These notes which were taken by Mr. A. S. Hathaway, lately a Fellow in Mathematics here, and now an instructor

in Cornell University, were printed by the papyrograph process. An edition of three hundred copies was sold at once. From a recent letter of Sir William Thomson, it appears that he is now expecting to recast these lectures and to issue them in a printed volume at an early day. An interesting account of the topics considered and of the methods employed in their discussion was published in *Nature* (London, Nos. 803, 805, 809, March, April, 1885) by Professor George Forbes, F. R. S., of London, who had been in Baltimore during the continuance of the course. This review has been reprinted in our current Circulars (Volume IV, page 113). As an indication of the impression made by the distinguished lecturer, Professor Forbes remarks: "The lectures treated of three branches of the subject: (1) the propagation of a disturbance through an elastic medium; (2) the character of molecular vibration; and (3) the influence of molecules on the propagation of waves. Each lecture generally dealt with two of these branches, and between the two parts of the lecture Sir William went among his audience and had some conversation with them. It was ever his object to discard the professorial attitude and give his lectures the aspect of conferences. Discussion did not end in the lecture-room, and the three weeks at Baltimore were like one long conference guided by the master-mind. It is not surprising

that at the end of that time there was a genuine feeling of sadness at parting on the part of teacher and taught alike."

The visit of Sir William Thomson recalled to many minds the previous and much longer residence among us of Professor Cayley of the University of Cambridge. After returning to England, he revised the lectures he had delivered here, making some important additions to them, and began to print the whole as a memoir in the American Journal of Mathematics. Seven chapters of this treatise on "the Abelian and Theta Functions" have already been published, and the editors anticipate the pleasure of seeing the memoir completed in subsequent numbers of the Journal.

LECTURES ON SHAKESPEARE AND OTHER PUBLIC LECTURES.

Special study was directed during the year to the writings of Shakespeare. Professor Corson, whose instructions during two preceding winters had exerted a marked influence in this community, gave twenty lectures upon Shakespeare, in January, February, and March. After two introductory discourses, he discussed ten of the principal plays, namely, Romeo and Juliet, King John, Much Ado about Nothing, Hamlet, Macbeth, Coriolanus, Julius Cæsar, Antony and Cleopatra, Winter's Tale, and Cymbeline. It was the speaker's purpose, as he stated it, to represent the poet's early, middle, and

late work, and, along with a presentation of the organic structure of the plays selected, to indicate Shakespeare's progress in the creation of character, to contrast his portrayal of characters with that of Ben Jonson and other contemporary dramatists, and especially to set forth his interpretation of life which is concretely resident in the plays,—in a word, to present the plays on the human side rather than on the scholastic.

In connection with this course, a Shakespeare Circle was formed among the students, and to those who were thus enrolled two dramatic recitals were given by David C. Bell, Esq., formerly of Canada and now of Washington. Two lectures were also given by Justin Winsor, Esq., of Harvard College, one on Shakespeare Bibliography and one on Shakespeare Portraiture, both illustrated by works which had been borrowed from the libraries in Baltimore and elsewhere, through the friendly mediation of Mr. J. W. M. Lee. It was intended to enlarge this list of lecturers on Shakespeare, but the inability of one Shakespeare scholar of great renown to accept the invitation which was extended to him, and the illness and death of another distinguished commentator interrupted the plan. At one of the Peabody concerts, under the direction of Mr. A. Hamerik, some pieces of music suggested by the return of Shakespeare's birthday were performed, but it was not found possible, with the

resources at our command, to secure a Shakespeare concert. Recitals of four plays were given at the Peabody Institute by Mr. Locke Richardson.

During the month of January, Mr. Edmund Gosse, of London, Clark Lecturer on English Literature in the University of Cambridge, gave a course of six lectures on the Rise of Classical Poetry in England from Shakespeare to Pope. These lectures have since been printed in a volume. Mr. Gosse by special request gave two other lectures of a less formal character on the poet Gray, of whose life and writings he had made a special study preparatory to the publication of a new edition of the poet's writings.

So large a number of persons desired to hear Professor Corson and Mr. Gosse that the authorities of the Peabody Institute kindly opened one of their large halls to the university and these lectures were therefore announced as under the auspices of both foundations.

Professor J. Rendel Harris gave a course of lectures on the Perpetuation of Ancient Manuscripts, addressed especially to the students of ancient languages, and subsidiary to philological, biblical, archæological, and historical research. As far as possible, they were illustrated by facsimiles and representations of the ancient documents to which reference was made. This course and the following were given in Hopkins Hall.

The modern science of Phonetics was presented in four lectures by Mr. A. Melville Bell, of Washington, the author of a work on "Visible Speech," which were followed by two lectures, from the same gentleman, on English Pronunciation.

A course of lectures on Spanish and Portuguese Literature was given by the principal teachers in the department of the Romance Languages. Mr. A. M. Elliott, the Associate Professor, took for his theme the life and writings of Camoens, and Mr. H. A. Todd, the Associate, discussed Contemporary Spanish Literature.

Mr. Rabillon gave forty lectures (in French) on select topics pertaining to French literature.

To the graduate students, a course of educational lectures was given on successive Saturdays, during the months of November, December and January. The speakers and their subjects were as follows:

D. C. Gilman, Academic degrees;
G. S. Hall, Student life;
S. Newcomb, Mathematics and education;
M. Bloomfield, Method of comparative philology as pursued to-day;
W. K. Brooks, The zoölogical significance of education;
T. Craig, Mathematical teaching in France;
A. M. Elliott, Methods in the study of modern languages;
R. T. Ely, Educational value of political economy;
J. R. Harris, On the study of ancient MSS.;
E. M. Hartwell, Physical training in American colleges;
W. E. Story, Methods of teaching arithmetic;
M. Warren, Application of the historical method to the study of Latin.

The Library.

The Library has made a constant growth during the year. Large purchases have been made of books pertaining to Psychology and Pedagogics, History and Political Science, and the Shemitic Languages. A set of the *Annales de Chimie et de Physique* (1790–1875) has also been bought.

From the Librarian's report it appears that the accessions of the year have been 4,600 volumes, making the whole number of bound volumes now belonging to the collection, 26,315. Of these accessions, those relating to certain special studies have been placed in the rooms where those studies are pursued, as in previous years. While there are objections to this segregation, the want of room in the main library compels it.

The present distribution is substantially as follows:

1. On the main floor of the central library, dictionaries, cyclopædias, and standard books in literature, history and philosophy;

2. In alcoves adjacent to the central room sets of literary periodicals and scientific transactions; works on philosophy and pedagogics; Romance, Teutonic, and English philology and literature; bibliography;

3. On the floor above the central library, works on ancient and modern history, public law and

political economy, including the Bluntschli collection;

4. In the classical rooms, the principal Greek and Latin writings;

5. In the oriental class rooms, books pertaining to Shemitic languages, and to Sanskrit;

6. In the chemical laboratory, the long sets of chemical journals, and works on chemistry;

7. In the biological laboratory, books of biology, physiology, medicine, and hygiene.

To a considerable extent, current periodicals are placed near the books to which they belong; but in the central room a very large number of those which are of general interest are retained.

The number of serials, scientific and literary, received by the university exceeds seven hundred. Including those which are taken by other public institutions of Baltimore, nine hundred periodicals, exclusive of newspapers, are accessible. In the Johns Hopkins University Circular No. 42 a list of those which are received by the university has been printed.

THE MINERALOGICAL CABINET.

The mineralogical cabinet has received no very important additions since the purchase of the Allen and Root collections last year. Several donations and the weekly excursions of the Naturalist's Field Club have considerably increased the

number of specimens from the vicinity of Baltimore, to which one case in the cabinet is especially devoted.

The petrographical cabinet has been enlarged by the purchase of a suite of typical European rocks, numbering over four hundred specimens and also by the acquisition of one of the collections made by Prof. C. H. Hitchcock to illustrate the rocks of New Hampshire, which have been so carefully studied and described by the late Dr. G. W. Hawes.

Several pieces of apparatus, including a new petrographical microscope and a diamond saw for cutting rock-sections, have been added to the mineralogical laboratory.

Publications.

The journals which are published under the auspices of the Trustees, have appeared regularly during the last year, and as far as I am capable of judging are more and more worthy of the financial support they have received from the university chest. The American Journal of Philology and the American Journal of Mathematics, which appear quarterly, and the American Chemical Journal appearing six times during the year, have reached respectively the sixth, the eighth, and the seventh volume. It is interesting to observe that a single number of the mathematical

journal contained seven contributions from writers resident in six different countries. The third volume of the Studies from the Biological Laboratory is in progress. It is devoted exclusively to the original work in biology of those who are or have been connected with this foundation. The Studies in Historical and Political Science do not appear as a journal, but as a series of monographs upon American institutions, contributed partly by members of our own body and partly by other writers. The third volume is nearly complete.

Of the Johns Hopkins University Circulars nine numbers, including 134 pages, were printed during the year. In addition to their use as the ready means of publishing official announcements, the Circulars are the repository of short abstracts of scientific inquiries which are here in progress.

Besides the periodicals above mentioned, the enterprise of one of the Fellows of this institution, A. L. Frothingham, Jr., Ph. D., has led to the commencement of a Journal of Archæology, to be published in Baltimore under his control as a managing editor, with the counsel and aid of prominent members of the American Institute of Archæology, of which it is to be an official organ. This journal is not printed under the auspices of this University and does not receive its financial support, but it is here regarded as

a very important agency in the promotion of American scholarship and as deserving the hearty encouragement of those who are interested in the progress of archæological science.

In this connection reference may be made to a series of exhibitions which were held during the winter under the auspices of the University Archæological Society in one of our halls. A large number of old and rare engravings and original drawings were loaned by Mr. A. L. Frothingham, the plates exhibited being frequently changed. Some interesting Italian antiquities of the Etruscan and Roman periods were also exhibited by him and by Mrs. L. Williams. These exhibitions were attended by our own students and also by many persons not connected with the university. Brief explanatory remarks were often addressed to the assembled company by the secretary of the society.

In the course of the winter, Rev. Dr. C. R. Hale, of Baltimore, while on a visit to Constantinople, secured photographs of three pages of the celebrated book which contains the manuscript "Teaching of the Twelve Apostles." So much interest had been shown in this ancient document, after it was transcribed and printed by Bishop Bryennios, — that the university decided to issue with explanatory notes a small edition of these photographs. They were edited by Prof. J. R. Harris,

and one hundred and twenty-five copies (to which the edition was limited) were quickly distributed. Reference has been made on a previous page to the published report of Sir W. Thomson's lectures.

GRADUATES OF THE YEAR.

Nine undergraduates have come forward to the baccalaureate degree during the year, namely: —

BACHELORS OF ARTS, 1884-85.

John Pendleton Campbell, West Virginia.
John Glenn, Jr., Baltimore.
Junius Moore Horner, North Carolina.
James Albert Loane, Baltimore.
Harry Wilbur Price, District of Columbia.
Benjamin Titus Roberts, Jr., New York.
Moses Roth Ryttenberg, Baltimore.
Hugo Steiner, Baltimore.
Henry Hazlehurst Wiegand, Baltimore.

Thirteen candidates, who had presented the requisite theses and had also passed the examinations successfully, were made doctors of philosophy, namely:

DOCTORS OF PHILOSOPHY, 1884-85.

Edward Webster Bemis, of Springfield, Mass., A. B., Amherst College, 1880. *Subjects:* History and Political Economy. *Thesis:* Local Government in Michigan and the Northwest.

Gustav Bissing, of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects:* Mathematics and Physics. *Thesis:* Some Notes on Gauss' Coordinates and Steiner's Quartic Surface.

Henry Herbert Donaldson, of New York City, A. B., Yale College, 1879. *Subjects:* Animal Physiology and Histology; Vegetable Physiology. *Thesis:* On the Temperature Sense.

Louis Duncan, of Baltimore, U. S. Naval Academy, 1880. *Subjects:* Physics and Mathematics. *Thesis:* On the Determination of the Ohm by the Lorenz Method.

Homer Winthrop Hillyer, of Waupun, Wis., S. B., University of Wisconsin, 1882. *Subjects:* Chemistry and Physics. *Thesis:* Methods of Determining the Relative Stability of the Fatty Bromides.

Frederic Schiller Lee, of Canton, New York, A. B., St. Lawrence University, 1878, and A. M., 1881. *Subjects:* Animal Physiology and Histology, and Animal Morphology. *Thesis:* On Arterial Tonicity.

Gustav Adolph Liebig, Jr., of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects:* Physics, Mathematics, and Chemistry. *Thesis:* On the Variation of the Specific Heat of Water.

James Playfair McMurrich, of Guelph, Canada, A. B., University of Toronto, 1879, and A. M., 1882. *Subjects:* Animal Morphology, Animal Physiology and Histology, and Vegetable Morphology. *Thesis:* The Osteology and Myology of *Amiurus catus.* (L.) Gill.

Albert Gallatin Palmer, of Baltimore, A. B., Johns Hopkins University, 1882. *Subjects:* Chemistry and Physics. *Thesis:* On the Conduct of p-Diazo-o-Toluene-sulphonic Acid toward Alcohol.

Harry Fielding Reid, of Baltimore, A. B., Johns Hopkins University, 1880. *Subjects:* Physics and Mathematics. *Thesis:* On the Distribution of Energy in the Spectrum of Platinum at Different Temperatures.

Henry Alford Short, of New York City, A. B., Columbia College, 1880. *Subjects:* Greek and Latin. *Thesis:* On the Development and Use of ὡς Final.

Morrison Isaac Swift, of Ashtabula, Ohio, A. B., Williams College, 1879. *Subjects:* Ethics and History of Philosophy, with Psychology and Political Economy. *Thesis:* On the Ethics of Idealism, as represented by Aristotle and Hegel.

Henry Alfred Todd, of Baltimore, A. B., Princeton College, 1876. *Subjects:* Romance Languages and Sanskrit. *Thesis:* An *editio princeps* of an Old French poem, entitled "Dit de la Panthère."

Personal Changes.

Professor J. Rendel Harris, who had requested that the tenure of his office might be limited by an annual appointment, declined re-election at the close of the academic session and returned to his former home in Cambridge, England. He had done much to awaken an interest in the studies to which he was devoted, but in matters which pertain to another department of the University he was not in accord with the policy here pursued and consequently gave up his chair. Corres-

pondence is in progress with a distinguished scholar now in Europe, looking forward to his coming here after the completion of certain work in which he is engaged abroad.

Dr. Henry Wood, Associate in the German Language and Dr. George H. Williams, Associate in Mineralogy have been designated Associate Professors, and Dr. H. A. Todd has been appointed Associate in the Romance Languages.

CHESAPEAKE ZOÖLOGICAL LABORATORY.

The Chesapeake Zoölogical Laboratory maintained its eighth session at Beaufort, N. C. A report of its work is given in the Appendix and abstracts of the scientific work are printed in University Circular, No. 43.

Special attention is called to the Appendix in which, — besides the usual register of names, — statements in respect to courses of lectures and classes will be found, and also a list of papers read before the various societies of the university.

D. C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, *November* 2, 1885.

APPENDIX.

A.

Professors, Associates, Etc., 1876-85.

The names in each group are arranged in the order of appointment. The column of dates indicates the period during which the particular station referred to has been held. In consequence of promotions some names appear in several groups.

PRESIDENT.

DANIEL C. GILMAN,		1875–

PROFESSORS.

BASIL L. GILDERSLEEVE,	*Greek*,	1876–
J. J. SYLVESTER,	*Mathematics*,	1876–1884.
IRA REMSEN,	*Chemistry*,	1876–
HENRY A. ROWLAND,	*Physics*,	1876–
H. NEWELL MARTIN,	*Biology*,	1876–
CHARLES D. MORRIS,	*Classics, (Collegiate)*,	1876–
PAUL HAUPT,	*Shemitic Languages*,	1883–
G. STANLEY HALL,	*Psychology*,	1884–
WILLIAM H. WELCH,	*Pathology*,	1884–
SIMON NEWCOMB,	*Mathematics and Astronomy*,	1884–

ASSOCIATE PROFESSORS.

HERBERT B. ADAMS,	*History*,	1883–
MAURICE BLOOMFIELD,	*Sanskrit*,	1883–
WILLIAM K. BROOKS,	*Morphology*,	1883–
THOMAS CRAIG,	*Applied Mathematics*,	1883–
CHARLES S. HASTINGS,	*Physics*,	1883–1884.
HARMON N. MORSE,	*Chemistry*,	1883–
WILLIAM E. STORY,	*Mathematics*,	1883–
MINTON WARREN,	*Latin*,	1883–
A. MARSHALL ELLIOTT,	*Romance Languages*,	1884–
J. RENDEL HARRIS,	*New Testament Greek*,	1884–1885.
GEORGE H. WILLIAMS,	*Mineralogy*,	1885–
HENRY WOOD,	*German*,	1885–

ASSOCIATES.

JOHN M. CROSS,	*Greek*,	1876–1881.
PHILIP R. UHLER,	*Natural History*,	1876–
AUSTIN SCOTT,	*History*,	1876–1882.
A. MARSHALL ELLIOTT,	*Romance Philology*,	1876–1884.
THOMAS C. MURRAY,	*Shemitic*,	1876–1879.
HERMAN C. G. BRANDT,	*German*,	1876–1882.
WILLIAM K. BROOKS,	*Biology*,	1876–1883.
HARMON N. MORSE,	*Chemistry*,	1876–1883.
ROBERT RIDGWAY,	*Natural History*,	1876–1877.
WILLIAM E. STORY,	*Mathematics*,	1876–1883.
ARTHUR W. TYLER,	*Librarian*,	1876–1878.
CHARLES S. HASTINGS,	*Physics*,	1876–1883.
CHARLES R. LANMAN,	*Sanskrit*,	1877–1880.
HERBERT B. ADAMS,	*History*,	1878–1883.
ALBERT S. COOK,	*English*,	1879–1881.
MINTON WARREN,	*Latin*,	1879–1883.
WILLIAM HAND BROWNE,	*Librarian and English*,	1879–
HENRY SEWALL,	*Biology*,	1880–1882.
THOMAS CRAIG,	*Mathematics*,	1880–1883.
MAURICE BLOOMFIELD,	*Sanskrit*,	1881–1883.
WILLIAM T. SEDGWICK,	*Biology*,	1881–1883.
HENRY WOOD,	*English*,	1881–1884.
FABIAN FRANKLIN,	*Mathematics*,	1882–
RICHARD T. ELY,	*Political Economy*,	1882–
J. FRANKLIN JAMESON,	*History*,	1883–
GEORGE H. WILLIAMS,	*Mineralogy*,	1883–1885.
EDWARD M. HARTWELL,	*Physical Training*,	1884–
HENRY WOOD,	*German*,	1884–1885.
ARTHUR L. KIMBALL,	*Physics*,	1884–
WILLIAM T. COUNCILMAN,	*Pathology*,	1884–
WILLIAM H. HOWELL,	*Biology*,	1885–
HENRY A. TODD,	*Romance Languages*,	1885–

LECTURERS.

Most of the persons named as lecturers have given courses of from six to twenty lectures. A few of them have given much longer courses, extending through half the year or through the entire year. In three cases, only single lectures have been given.

SIMON NEWCOMB,	*Astronomy*,	1876.
LÉONCE RABILLON,	*French*,	1876–
JOHN S. BILLINGS,	*Medical History, etc.*,	1877.
FRANCIS J. CHILD,	*Chaucer, Ballads, etc.*,	1877–1878.
THOMAS M. COOLEY,	*Law*,	1877–1879.

JULIUS E. HILGARD,	*Geodetic Surveys,*	1877.
JAMES RUSSELL LOWELL,	*Romance Literature,*	1877.
JOHN W. MALLET,	*Technological Chemistry,*	1877–1878.
FRANCIS A. WALKER,	*Political Economy,*	1877–1878.
WILLIAM D. WHITNEY,	*Comparative Philology,*	1877.
WILLIAM F. ALLEN,	*History,*	1878.
WILLIAM JAMES,	*Psychology,*	1878.
GEORGE S. MORRIS,	*Philosophy,*	1878–1885.
J. LEWIS DIMAN,	*History,*	1879.
H. VON HOLST,	*History,*	1879.
WILLIAM G. FARLOW,	*Botany,*	1879.
J. WILLARD GIBBS,	*Theoretical Mechanics,*	1879.
SIDNEY LANIER,	*English Literature,*	1879–1881.
CHARLES S. PEIRCE,	*Logic,*	1879–1884.
JOHN TROWBRIDGE,	*Physics,*	1880.
A. GRAHAM BELL,	*Phonology,*	1881.
S. P. LANGLEY,	*Physics,*	1881.
JOHN MCCRADY,	*Biology,*	1881.
JAMES BRYCE,	*Political Science,*	1881.
EDWARD A. FREEMAN,	*History,*	1881.
JOHN J. KNOX,	*Banking,*	1881.
ARTHUR CAYLEY,	*Mathematics,*	1882.
WILLIAM W. GOODWIN,	*Plato,*	1882.
G. STANLEY HALL,	*Psychology,*	1882–1884.
RICHARD M. VENABLE,	*Constitutional Law,*	1882.
JAMES A. HARRISON,	*Anglo-Saxon,*	1882.
J. RENDEL HARRIS,	*New Testament Greek,*	1882–1884.
GEORGE W. CABLE,	*English Literature,*	1883.
WILLIAM W. STORY,	*Michel Angelo,*	1883.
HIRAM CORSON,	*English Literature,*	1883–1885.
F. SEYMOUR HADEN,	*Etchers and Etching,*	1883.
JOHN S. BILLINGS,	*Municipal Hygiene,*	1883–
JAMES BRYCE,	*Roman Law,*	1883.
H. VON HOLST,	*Political Science,*	1883.
WILLIAM TRELEASE,	*Botany,*	1884.
J. THACHER CLARKE,	*Explorations in Assos,*	1884.
JOSIAH ROYCE,	*Philosophy,*	1884.
WILLIAM J. STILLMAN,	*Archæology,*	1884.
CHARLES WALDSTEIN,	*Archæology,*	1884.
SIR WILLIAM THOMSON,	*Molecular Dynamics,*	1884.
A. MELVILLE BELL,	*Phonetics, etc.,*	1885.
EDMUND GOSSE,	*English Literature,*	1885.
EUGENE SCHUYLER,	*U. S. Diplomacy,*	1885.
JUSTIN WINSOR,	*Shakespeare,*	1885.
FREDERICK WEDMORE,	*Modern Art,*	1885.

INSTRUCTORS AND ASSISTANTS.

HENRY SEWALL,	*Biology*,	1876–1878.
SAMUEL F. CLARKE,	*Biology*,	1879–1881.
FABIAN FRANKLIN,	*Mathematics*,	1879–1882.
LYMAN B. HALL,	*Chemistry*,	1879–1880.
CHRISTIAN SIHLER,	*Biology*,	1879–1880.
HENRY C. ADAMS,	*Political Economy*,	1879–1881.
THOMAS CRAIG,	*Mathematics*,	1879–1880.
CHAS. L. WOODWORTH, JR.,	*Elocution*,	1879–
WILLIAM T. SEDGWICK,	*Biology*,	1880–1881.
EDWIN H. HALL,	*Physics*,	1880–1881.
GEORGE H. STOCKBRIDGE,	*Latin and German*,	1880–1881.
PHILIPPE B. MARCOU,	*French*,	1880–1883.
HUGH NEWELL,	*Drawing*,	1880–
R. DORSEY COALE,	*Chemistry*,	1881–1883.
RICHARD T. ELY,	*Political Economy*,	1881–1882.
LAWRENCE B. FLETCHER,	*Physics*,	1881.
GEORGE F. NICOLASSEN,	*Greek and Latin*,	1881–1882.
BENJAMIN E. SMITH,	*Philosophy*,	1881–1882.
EDMUND B. WILSON,	*Biology*,	1881–1882.
JAMES W. BRIGHT,	*German*,	1882–1883.
J. FRANKLIN JAMESON,	*History*,	1882–1883.
EDWARD H. SPIEKER,	*Greek and Latin*,	1882–
HARRY F. REID,	*Physics*,	1882–1884.
CHARLES F. RADDATZ,	*German*,	1882–1885.
EDWARD M. HARTWELL,	*Physical Training*,	1883–1884.
HERBERT W. CONN,	*Osteology*,	1883–1884.
G. THEODORE DIPPOLD,	*German*,	1883–1884.
HENRY H. DONALDSON,	*Animal Physiology*,	1883–1884.
HENRY A. TODD,	*Romance Languages*,	1883–1885.
OTTO LUGGER,	*Curator of Biol. Museum*,	1883–1885.
CHARLES A. PERKINS,	*Physics*,	1884–
WILLIAM H. HOWELL,	*Biology*,	1884–1885.
EDWARD H. KEISER,	*Chemistry*,	1884–1885.
J. PLAYFAIR MCMURRICH,	*Osteology, etc.*,	1884–
ALFRED EMERSON,	*Archæology*,	1884–1885.
EDWARD S. BURGESS,	*Botany*,	1885.
GEORGE HEMPL,	*German*,	1884–
JAMES W. BRIGHT,	*English*,	1885–
HENRY H. DONALDSON,	*Psychology*,	1885–
JULIUS GOEBEL,	*German*,	1885–
EDMUND RENOUF,	*Chemistry*,	1885–

B.

Roll of Fellows.

The following list gives the names of all persons who have been selected by the authorities and appointed to fellowships. Though, in a few cases, by reason of promotion or other causes, the persons designated have not entered upon the fellowships, their names are given to exhibit fully the working of this system of appointment.

The present position or residence of the former holders of fellowships is, in most cases, given after the name.

HENRY C. ADAMS, PH. D., . . . *Political Science*, . 1876–1879.
Associate Professor of Political Economy, Cornell University; Lecturer on Political Economy, University of Michigan.

HERBERT B. ADAMS, PH. D., . . *History*, . . . 1876–1878.
Associate Professor of History, Johns Hopkins University.

WILLIAM K. BROOKS, PH. D., . . *Biology*, . . . 1876.
Associate Professor of Morphology, and Director of the Chesapeake Zoölogical Laboratory, Johns Hopkins University. (*Appointed Associate before entering on the Fellowship*).

THOMAS CRAIG, PH. D., . . . *Mathematics*, . . 1876–1879.
Associate Professor of Applied Mathematics, Johns Hopkins University.

JOSHUA W. GORE, C. E., . . . *Mathematics*, . . 1876–1878.
Professor of Natural Philosophy and Engineering, University of North Carolina.

GEORGE B. HALSTED, PH. D., . . *Mathematics*, . . 1876–1878.
Professor of Mathematics, University of Texas.

EDWARD HART, PH. D., . . . *Chemistry*, . . . 1876–1878.
Assistant Professor of Chemistry, Lafayette College.

DANIEL W. HERING, C. E., . . *Engineering*, . . 1876–1878.
Professor of Mathematics, University of the City of New York.

MALVERN W. ILES, PH. D., . . *Chemistry*, . . . 1876–1878.
Chemist, Leadville, Colorado.

WILLIAM W. JACQUES, PH. D., . . *Physics*, . . . 1876–1879.
Instructor in Telegraph Engineering, Massachusetts Institute of Technology.

CHARLES R. LANMAN, PH. D., . . *Sanskrit*, . . . 1876–1877.
Professor of Sanskrit, Harvard University.

D. MCGREGOR MEANS, A. B., . . *Political Science*, . 1876–1877.
Late Professor of Political and Mental Science, Middlebury College; Attorney at Law, New York City.

HARMON N. MORSE, PH. D., . . *Chemistry*, . . . 1876.
Associate Professor of Chemistry, Johns Hopkins University. (*Appointed Associate before entering upon the Fellowship*).

WALTER H. PAGE, ... *Greek*, . . . 1876–1878.
Journalist, Raleigh, N. C.

P. PORTER POINIER, M. E., . . *Physics*, . . . 1876.
(*Died without entering upon the Fellowship, June*, 1876, *aged* 23 *years*).

E. DARWIN PRESTON, C. E., . . *Engineering*, . . 1876–1878.
U. S. Coast and Geodetic Survey; National Observatory, Cordoba, Argentine Republic.

HENRY J. RICE, SC. D., . . . *Biology*, . . . 1876–1878.
Professor of Natural Science, Brooklyn (N. Y.) High School

JOSIAH ROYCE, PH. D., . . . *Philosophy*, . . 1876–1878.
Assistant Professor of Philosophy, Harvard University.

ERNEST G. SIHLER, PH. D., . . . *Greek*, . . . 1876–1879.
Classical Instructor, New York City.

FREDERICK B. VAN VORST, A. B., . *Ethics and Metaphysics*, 1876–1877.
Attorney at Law, New York City.

JOHN H. WHEELER, PH. D., . . *Philology*, . . . 1876–1877.
Professor of Greek, University of Virginia.

SAMUEL F. CLARKE, PH. D., . . *Biology*, . . . 1876–1879.
Professor of Natural History, Williams College.

LYMAN B. HALL, PH. D., . . . *Chemistry*, . . . 1877–1879.
Professor of Chemistry and Physics, Haverford College, Pa.

A. DUNCAN SAVAGE, B. LITT., . . *Greek*, . . . 1876–1879.
New York City.

FABIAN FRANKLIN, PH. D., . . *Mathematics*, . . 1877–1879.
Associate in Mathematics, Johns Hopkins University.

CHRISTIAN SIHLER, M. D., PH. D., . *Biology*, . . . 1877–1879.
Physician, Cleveland, Ohio.

FRANCIS G. ALLINSON, PH. D., . . *Greek and Sanskrit*, . 1877–1880.
Assistant Professor of Greek and Latin, Haverford College, 1880–82; Classical Instructor, Baltimore.

MAURICE BLOOMFIELD, PH. D., . . *Sanskrit and Greek*, . 1878–1879.
Associate Professor of Sanskrit, Johns Hopkins University.

CONSTANTINE FAHLBERG, PH. D., . *Chemistry*, . . . 1878–1880.
Chemist, Gray's Ferry Chemical Works, Philadelphia.

EDWIN H. HALL, PH. D., . . . *Physics*, . . . 1878–1880.
Instructor in Physics, Harvard University.

EDWARD COLES HARDING, A. M., . *Greek*, . . . 1878–1879.
Professor of Greek, University of Louisiana, 1879–80.

ISAAC OTT, M. D., ... *Biology*, . . . 1878–1879.
Physician, Easton, Pa.

HENRY SEWALL, PH. D., . . . *Biology*, . . . 1878–1879.
Professor of Physiology, University of Michigan.

WASHINGTON I. STRINGHAM, PH. D., *Mathematics*, . . 1878–1880.
Professor of Mathematics, University of California.

ABRAM V. E. YOUNG, PH. B., . . *Chemistry*, . . . 1878–1880.
Professor of Chemistry, Northwestern University.

CHARLES R. HEMPHILL, A. M., D. D., *Greek*, . . . 1878–1879.
Late Associate Professor of Biblical Literature, Theological Seminary, Columbia, S. C.; Clergyman, Louisville, Ky.

ALLAN MARQUAND, PH. D., . . *Logic and Ethics*, . 1877–1880.
Professor of the History of Art, Princeton College.

CHARLES A. VAN VELZER, S. B., . *Mathematics*, . . 1878–1881.
Assistant Professor of Mathematics, University of Wisconsin.

BROWN AYRES, S. B., ... *Physics*, . . . 1879–1880.
Professor of Physics, Tulane University, New Orleans.

LOUIS BEVIER, PH. D., . . . *Greek*, . . . 1879–1881.
Instructor in French in Rutgers College.

EDWARD M. HARTWELL, M. D., PH. D., *Biology*, . . . 1879–1881.
Associate in Physical Training, Johns Hopkins University.

JOHN R. MCD. IRBY, PH. D., . . *Mineralogy*, . . 1879–1880.
(*Died March* 25, 1880, *aged* 25 *years*).

MITSURU KUHARA, PH. D., . . *Chemistry*, . . . 1879–1881.
Lecturer on Organic Chemistry, University of Tokio, Japan.

OSCAR H. MITCHELL, PH. D., . . *Mathematics*, . . 1879–1882.
Professor of Mathematics, Marietta College, Ohio.

EDWARD L. NICHOLS, PH. D., . . *Physics*, . . . 1879–1880.
Professor of Physics and Chemistry, University of Kansas.

WALDO S. PRATT, A. M., . . . *Aesthetics, etc.*, . . 1879–1880.
Instructor in Ecclesiastical Music, Theological Seminary, Hartford, Conn.

WILLIAM T. SEDGWICK, PH. D., . *Biology*. . . . . 1879–1880.
Assistant Professor of Biology, Massachusetts Institute of Technology.

HERMAN VOORHEES, C. E., . . *Chemistry*, . . . 1879.
(*Died without entering on the Fellowship, October* 14, 1879, *aged* 27 *years*).

CHARLES O. WHITMAN, PH. D., . . *Biology*, . . . 1879.
Professor of Zoölogy, University of Tokio, Japan, 1879–81; Marine Station, Naples, 1881–82; Assistant, Museum of Comparative Zoölogy, Cambridge, Mass. (*Resigned before entering on the Fellowship*).

EDMUND B. WILSON, PH. D., . . *Biology*, . . . 1879–1881.
Associate Professor of Biology, Bryn Mawr College, Pa.

GEORGE F. NICOLASSEN, PH. D., . *Greek*, ... 1879–1881.
Professor of Greek and Latin, Southwestern Presbyterian University, Tenn.

WILLIAM BURNEY, PH. D., . . *Chemistry*, . . . 1879–1880.
Professor of Chemistry, South Carolina Agricultural College, Columbia.

ROBERT W. PRENTISS, S. B., . . *Mathematics*, . . 1879–1881.
Office of U. S. Nautical Almanac, Washington, D. C.

JAMES W. BRIGHT, PH. D., . . *Teutonic Languages*, . 1880–1882.
Instructor in English, Johns Hopkins University.

BENJAMIN C. BURT, A. M., . . *Philosophy*, . . . 1880–1881.
Assistant Professor of English and Rhetoric, University of Michigan.

SPENCER H. FREEMAN, A. M., . . *Physics*, . . . 1880–1882.
Professor of Physics and Astronomy, Adelbert College, Western Reserve University, Ohio.

KAKICHI MITSUKURI, PH. D., . . *Biology*, . . . 1880–1881.
Professor of Zoölogy, University of Tokio, Japan.

BERNARD F. O'CONNOR, PH. D., . *Romance Languages*, . 1880–1882.
Instructor in French, Columbia College.

CHASE PALMER, PH. D., . . . *Chemistry*, . . . 1880–1882.
Professor of Chemistry, Massachusetts State Normal School, Salem.

HERBERT M. PERRY, A. B., . . *Mathematics*, . . 1880–1882.
Instructor in Mathematics, Cascadilla School, Ithaca, N. Y.

WILLIAM L. ROWLAND, S. B., . . *Chemistry*, . . . 1880.
(*Did not enter upon the Fellowship*).

EDWARD H. SPIEKER, PH. D., . . *Greek*, . . . 1880–1882.
Instructor in Greek and Latin, Johns Hopkins University.

MORRISON I. SWIFT, PH. D., . . *Philosophy*, . . 1880–1882.
Instructor in Logic and Political Economy, Hobart College, 1882–84.

ARTHUR W. WHEELER, A. B., . . *Physics*, . . . 1880–1881.
(*Died, January* 6, 1881, *aged* 21 *years*).

R. DORSEY COALE, PH. D., . . . *Chemistry*, . . . 1880–1881.
Professor of Chemistry and Toxicology, University of Maryland.

A. F. WILHELM SCHIMPER, PH. D., . *Biology*, . . . 1880–1881.
Privat-Docent, University of Bonn, Germany.

LAWRENCE B. FLETCHER, PH. D., . *Physics*, . . . 1880–1881.
Instructor in Physics, Wesleyan University, Middletown, Conn., 1882–83.

WILLIAM J. ALEXANDER, PH. D., . *Greek*, . . . 1881–1883.
Professor of English, Dalhousie College, Halifax, Nova Scotia.

EDWARD S. BURGESS, A. B., . . *Greek*, . . . 1881–1882.
Instructor, Washington (D. C.) High School.

WILLIAM J. COMSTOCK, PH. B., . . *Chemistry*, . . . 1881–1882.
Student of Chemistry, University of Munich.

WILLIAM C. DAY, PH. D., . . . *Chemistry*, . . . 1881–1883.
Professor of Chemistry and Physics, University of Nashville, Tenn.

HENRY H. DONALDSON, PH. D., . *Biology*, . . . 1881–1883.
Instructor in Psychology, Johns Hopkins University.

WILLIAM P. DURFEE, PH. D., . . *Mathematics*, . . 1881–1883.
Professor of Mathematics, Hobart College, N. Y.

GEORGE S. ELY, PH. D., . . . *Mathematics*, . . 1881–1883.
Professor of Mathematics, Buchtel College, 1883–84; Assistant Examiner, U. S. Patent Office.

J. FRANKLIN JAMESON, PH. D., . *History*, . . . 1881–1882.
Associate in History, Johns Hopkins University.

C. HERSCHEL KOYL, A. B., . . *Physics*, . . . 1881–1883.
Instructor in Physics, Washington (D. C.) High School.

HENRY L. OSBORN, PH. D., . . *Biology*, . . . 1881–1882.
Professor of Zoölogy, Purdue University, Lafayette, Indiana.

HENRY N. STOKES, PH. D., . . *Biology*, . . . 1881–1883.
Student of Chemistry in Germany.

BENJAMIN W. WELLS, PH. D., . . *English*, . . . 1881.
Instructor in English, Friends' School, Providence, R. I.

BENJAMIN I. GILMAN, A. B., . . *Logic*, . . . 1881–1882.
Student of Philosophy in Europe.

CHARLES J. BELL, A. B., . . . *Chemistry*, . . . 1882.
Professor of Chemistry, Pennsylvania State College, 1882–85; Fellow by Courtesy, Johns Hopkins University. (*Did not enter upon the Fellowship*).

JAMES M. CATTELL, A. B., . . . *Philosophy*, . . 1882–1883.
Student of Philosophy in Germany.

ELLERY W. DAVIS, PH. D., . . *Mathematics*, . . 1882–1884.
Professor of Mathematics and Military Tactics, Florida Agricultural College.

DAVID T. DAY, PH. D., . . . *Chemistry*, . . . 1882–1884.
Johns Hopkins University.

ALFRED EMERSON, PH. D., . . *Greek*, . . . 1882–1884.
Instructor in Classical Archæology, Johns Hopkins University, 1884–85; Fellow by Courtesy, Johns Hopkins University.

WILLIAM S. FLEMING, A. B., . . *Greek*, . . . 1882–1883.
Professor of Greek and German, Davidson College, 1883–85.

ARTHUR L. FROTHINGHAM, JR., PH. D., *Shemitic Languages*, . 1882–1885.
Fellow by Courtesy, Johns Hopkins University; Editor of the American Journal of Archæology.

HENRY R. GOODNOW, A. B., . . *Physics*, . . . 1882–1883.

ELGIN R. L. GOULD, A. B., . . *History*, . . . 1882–1884.
Instructor in History, Washington (D. C.) High School.

ARTHUR S. HATHAWAY, S. B., . . *Mathematics*, . . 1882–1884.
Instructor in Mathematics, Cornell University, N. Y.

WILLIAM H. HOWELL, PH. D., . . . *Biology*, . . . 1882–1884.
Associate in Biology, Johns Hopkins University.

ARTHUR L. KIMBALL, PH. D., . . *Physics*, . . . 1882–1883.
Associate in Physics, Johns Hopkins University.

HARRY F. REID, PH. D., . . . *Physics*, . . . 1882.
Student of Physics in Cambridge, England.

EDWARD H. KEISER, PH. D., . . *Chemistry*, . . . 1882–1884.
Associate Professor of Chemistry, Bryn Mawr College, Pa.

WILLIAM M. ARNOLT, B. D., . . *Greek*, . . . 1883–1885.
Fellow by Courtesy, Johns Hopkins University.

GUSTAV BISSING, PH. D., . . . *Mathematics*, . . 1883–1884.
Assistant Examiner, U. S. Patent Office.

ADAM T. BRUCE, A. B., . . . *Biology*, . . . 1883–1884.
Fellow by Courtesy, Johns Hopkins University.

ARCHIBALD L. DANIELS, A. B., . . *Mathematics*, . . 1883–1884.
Instructor in Mathematics, Chicago Manual Training School.

JOHN DEWEY, PH. D., . . . *Philosophy*, . . 1883–1884.
Instructor in Philosophy, University of Michigan.

JAMES R. DUGGAN, M. D., PH. D., . *Chemistry*, . . 1883–1884.
Fellow by Courtesy, Johns Hopkins University.

HANS C. G. VON JAGEMANN, PH. D., . *Modern Languages*, . 1883–1884.
Professor of Modern Languages, Earlham College, Richmond, Ind.

GUSTAV A. LIEBIG, JR., PH. D., . *Physics*, . . . 1883–1885.
Fellow by Courtesy, Johns Hopkins University.

C. W. EMIL MILLER, A. B., . . *Greek*, . . . 1883–1885.
Fellow by Courtesy, Johns Hopkins University.

CHARLES A. PERKINS, PH. D., . . *Physics*, . . . 1883–1884.
Assistant in Physics, Johns Hopkins University.

LEWIS T. STEVENS, A. B., . . . *Biology*, . . . 1883–1884.
Student of Medicine, Harvard University.

LEWIS W. WILHELM, PH. D., . . *History*, . . . 1883–1884.
Baltimore.

HOMER W. HILLYER, PH. D., . . *Chemistry*, . . . 1884–1885.
Assistant in Chemistry, University of Wisconsin.

FREDERIC S. LEE, PH. D., . . . *Biology*, . . . 1884–1885.
Student of Biology in Germany.

CHARLES H. LEVERMORE, A. B., . *History*, . . . 1884–1885.
New Haven, Conn.

HENRY F. NACHTRIEB, S. B., . . *Biology*, . . . 1884–1885.
Assistant Professor of Biology, University of Minnesota, Minneapolis.

HENRY B. NIXON, ... *Mathematics*, . . 1884–1885.
Fellow by Courtesy, Johns Hopkins University.

WILLIAM NOYES, JR., A. B., M. D., . *Psychology*, . . 1884–1885.
Fellow by Courtesy, Johns Hopkins University.

ALBERT G. PALMER, PH. D., . . *Chemistry*, . . . 1884–1885.
Assistant in Chemistry, Swarthmore College, Pa.

ALBERT H. TOLMAN, A. B., . . *English*, . . . 1884.
Professor of English Literature and Rhetoric, in Ripon College, Wisc. (*Resigned before entering on the Fellowship*).

WOODROW WILSON, A. B., . . . *History*, . . . 1884–1885.
Associate in History, Bryn Mawr College, Pa.

ARTHUR MCDONALD, A. B., . . *Psychology*, . . 1885.
(*Resigned before entering on the Fellowship*).

CHARLES B. WRIGHT, A. B., . . *English*, . . . 1885.
Professor of English Literature and Rhetoric, in Middlebury College, Vt. (*Resigned before entering on the Fellowship*).

PRESENT HOLDERS OF FELLOWSHIPS.

CYRUS ADLER, A. B., . . . *Shemitic Languages*, . 1885–
ETHAN A. ANDREWS, PH. B., . . *Biology*, . . . 1884–
DAVID BARCROFT, PH. B., . . . *Mathematics*, . . 1885–
W. SHIRLEY BAYLEY, A. B., . . *Geology & Petrography*, 1885–
LOUIS BELL, A. B., ... *Physics*, . . . 1885–
FRANK A. CHRISTIE, A. B., . . *Greek*, . . . 1885–
HENRY CREW, A. B., ... *Physics*, . . . 1884–
DAVIS R. DEWEY, A. B., . . . *History*, . . . 1885–
ALBERT E. EGGE, A. B., . . . *Teutonic Languages*, . 1885–
WILLIAM H. EMERSON, . . . *Chemistry*, . . . 1885–
JOHN C. FIELDS, A. B., . . . *Mathematics*, . . 1885–
ABEL H. HUIZINGA, A. B., . . *Shemitic Languages*, . 1884–
JOSEPH JASTROW, A. B., . . . *Psychology*, . . 1885–
GEORGE T. KEMP, A. B., . . . *Biology*, . . . 1885–
MARION D. LEARNED, A. B., . . *Modern Languages*, . 1885–
GONZALEZ LODGE, A. B., . . . *Greek*, . . . 1885–
CHARLES S. PALMER, A. B., . . *Chemistry*, . . 1885–
ERNEST M. PEASE, A. B., . . . *Latin*, . . . 1884–
CHARLES WHETHAM, A. B., . . *Romance Languages*, . 1885–

C.

Graduates.

DEGREES CONFERRED HONORIS CAUSÂ.

1880.

HENRY A. ROWLAND, PH. D., Professor of Physics, Johns Hopkins University.

1881.

RUTHERFORD B. HAYES, LL. D., President of the United States.

DEGREES CONFERRED ON EXAMINATION.

1878.

DOCTORS OF PHILOSOPHY.

HENRY CARTER ADAMS. (F). A. B., Iowa, 1874.—Lecturer on Political Economy, University of Michigan; Associate Professor of Political Economy, Cornell University.

THOMAS CRAIG. (F). C. E., Lafayette, 1875.—Associate Professor of Mathematics, Johns Hopkins University.

JOSIAH ROYCE. (F). A. B., Univ. of California, 1875.—Assistant Professor of Philosophy, Harvard University.

ERNEST GOTTLIEB SIHLER. (F). Concordia, 1869.—Classical Instructor, New York City. (4)

1879.

DOCTORS OF PHILOSOPHY.

MAURICE BLOOMFIELD. (F). A. M., Furman, 1877.—Associate Professor of Sanskrit, Johns Hopkins University.

SAMUEL FESSENDEN CLARKE. (F). Ph. B., Yale, 1878.—Professor of Natural History, Williams College.

GEORGE BRUCE HALSTED. (F). A. B., Princeton, 1875.—Professor of Mathematics, University of Texas.

EDWARD HART. (F). S. B., Lafayette, 1874.—Assistant Professor of Chemistry, Lafayette College.

WILLIAM WHITE JACQUES. (F). S. B., Mass. Inst. of Technology, 1876.—Instructor in Telegraph Engineering, Massachusetts Institute of Technology.

HENRY SEWALL. (F). S. B., Wesleyan, 1876.—Professor of Physiology, University of Michigan. (6)

F. Holders of Fellowships.

BACHELORS OF ARTS.

GEORGE WASHINGTON MCCREARY. Engaged in mercantile pursuits, Baltimore.

CHASE PALMER. (F). Professor of Chemistry, Massachusetts State Normal School.

EDWARD HENRY SPIEKER. (F). Instructor in Greek and Latin, Johns Hopkins University. (3)

1880.

DOCTORS OF PHILOSOPHY.

FRANCIS GREENLEAF ALLINSON. (F). A. B., Haverford, 1876; A. B., Harvard, 1877.—Late Assistant Professor of Greek and Latin, Haverford College; Classical Instructor, Baltimore.

FABIAN FRANKLIN. (F). Ph. B., Columbian, 1869.—Associate in Mathematics, Johns Hopkins University.

EDWIN HERBERT HALL. (F). A. B., Bowdoin, 1875.—Instructor in Physics, Harvard University.

ALLAN MARQUAND. (F). A. B., Princeton, 1874.—Professor of the History of Art, Princeton College.

WASHINGTON IRVING STRINGHAM. (F). A. B., Harvard, 1877.—Professor of Mathematics, University of California. (5)

BACHELORS OF ARTS.

THOMAS MILTON BEADENKOPF. Student of Theology, Yale College.

ALLEN KERR BOND. M. D., University of Maryland, 1882.—Physician, Baltimore.

WILLIAM CATHCART DAY. (F). Professor of Chemistry and Physics, University of Nashville, Tenn.

HENRY LAURENCE GANTT. M. E., Stevens Institute of Technology, 1884.—Mechanical Engineer, Baltimore.

EDGAR GOODMAN. LL. B., University of Maryland, 1881.—Attorney at Law, Baltimore.

CARL ECKHARDT GRAMMER. Minister of the Protestant Episcopal Church, Hancock, Md.

ALEXANDER FRIDGE JAMIESON. Instructor, Lawrenceville, N. J.

*EDMUND ALLEN JARVIS. *Died October* 15, 1880, *aged* 22 *years.*

STEWART BRIAN LINTHICUM. LL. B., University of Maryland, 1882.—Attorney at Law, Portland, Oregon.

JOHN HANSON LOWE. LL. B., University of Maryland, 1882.—Attorney at Law, Baltimore.

LEIGH CLINTON MORGAN. Minister of the Protestant Episcopal Church, Brooklyn, N. Y.

NELSON PALMER. Engaged in mercantile pursuits, Baltimore.

THOMAS PETTIGREW. Creswell, N. C.

HARRY FIELDING REID. (F). Assistant in Physics, Johns Hopkins University, 1882-84.—Now Student of Physics in Cambridge, England.

WILTZ RAYMOND STRICKLEN. Minister of the Methodist Episcopal Church, Baltimore.

LEWIS WEBB WILHELM. (F). Baltimore. (16)

1881.

DOCTORS OF PHILOSOPHY.

LOUIS BEVIER. (F). A. B., Rutgers, 1878.—Instructor in French in Rutgers College.

ROBERT DORSEY COALE. (F). Professor of Chemistry and Toxicology, University of Maryland.

EDWARD ALLEN FAY. A. B., University of Michigan, 1862.—Professor of History and Languages, National Deaf-Mute College.

LAWRENCE BUNTING FLETCHER. (F). A. B., Columbia, 1877.—Instructor in Physics, Wesleyan University, 1882-84.

SAMUEL GARNER. A. B., St. John's, 1871.—Professor of Modern Languages, University of Indiana.

EDWARD MUSSEY HARTWELL. (F). A. B., Amherst, 1873; M. D., Miami Medical College, 1882.—Associate in Physical Training, Johns Hopkins University.

WILLIAM THOMPSON SEDGWICK. (F). Ph. B., Yale, 1877.—Assistant Professor of Biology, Massachusetts Institute of Technology.

CHRISTIAN SIHLER. (F). Concordia, 1866; M. D., University of Michigan, 1871.—Physician, Cleveland, O.

EDMUND BEECHER WILSON. (F). Ph. B., Yale, 1878.—Lecturer on Biology, Williams College, 1883-84; Associate Professor of Biology, Bryn Mawr College, Pa. (9)

BACHELORS OF ARTS.

WILLIAM WILSON BADEN. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

HENRY JOHNS BOWDOIN. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

JOHN WILSON BROWN. Baltimore.

DAVID TALBOTT DAY. (F). Johns Hopkins University.

WILLIAM HENRY HOWELL. (F). Associate in Biology, Johns Hopkins University.

JOHN JOHNSON. Instructor, McDonogh School.

JAMES EDWARD KEELER. Assistant, Allegheny (Pa.) Astronomical Observatory.

EDWIN GEORGE RICHARDSON. Clergyman of the Protestant Episcopal Church, Milwaukee, Wis.

ADONIRAM JUDSON ROBINSON. LL. B., University of Maryland, 1885.—Instructor in Baltimore City College.

HENRY ROLANDO. M. D., University of Maryland, 1883.—Now connected with the Presbyterian Hospital, New York City.

LEE SALE. LL. B., Washington University, 1885.—Attorney at Law, St. Louis, Mo.

MACTIER WARFIELD. M. D., University of Maryland, 1884.—Physician, Baltimore. (12)

1882.

DOCTORS OF PHILOSOPHY.

JAMES WILSON BRIGHT. (F). A. B., Lafayette, 1877.—Instructor in English, Johns Hopkins University.

JOHN FRANKLIN JAMESON. (F). A. B., Amherst, 1879.—Associate in History, Johns Hopkins University.

MITSURU KUHARA. (F). S. B., University of Tokio, 1877.—Lecturer on Organic Chemistry, University of Tokio.

ROBERT W. MAHON. C. E., Lehigh, 1876.—Adjunct Professor of Chemistry, Lafayette College, 1882-83; Chemist, Camden, N. J.

OSCAR HOWARD MITCHELL. (F). A. B., Marietta, 1875.—Professor of Mathematics, Marietta College.

GEORGE FREDERICK NICOLASSEN. (F). A. B., University of Virginia, 1879.—Professor of Ancient Languages, Southwestern Presbyterian University.

WILLIAM ALBERT NOYES. A. B., Iowa, 1879.—Professor of Chemistry, University of Tennessee.

CHASE PALMER. (F). A. B., Johns Hopkins, 1879.—Professor of Chemistry, Mass. State Normal School.

EDWARD HENRY SPIEKER. (F). A. B., Johns Hopkins, 1879.—Instructor in Greek and Latin, Johns Hopkins University. (9)

BACHELORS OF ARTS.

WILLIAM HUGHLETT ADKINS. LL. B., University of Maryland, 1883.—Attorney at Law, Baltimore.

THOMAS ALEXIS BERRY. Graduate Student, Johns Hopkins University.

GUSTAV BISSING. (F). Fellow, Johns Hopkins University, 1883-84.—Assistant Examiner, U. S. Patent Office.

WALTER BERNARD CLARKSON. Principal of the Duval High School, Jacksonville, Fla., 1880-83.

HERMANN LOUIS EBELING. Instructor, Bloomfield, N. J.

LOUIS GARTHE. Baltimore.

EDWARD INGLE. Baltimore.

RICHARD FULLER KIMBALL. LL. B., University of Maryland, 1884.—Attorney at Law, Baltimore.

GUSTAV ADOLPH LIEBIG, JR. (F). Fellow by Courtesy, Johns Hopkins University.

CHARLES WILLIAM EMIL MILLER. (F). Johns Hopkins University.

JAMES PAGE. Baltimore.

ALBERT GALLATIN PALMER. (F). Assistant in Chemistry, Swarthmore College, Pa.

ROBERT MILLER REESE. Engaged in mercantile pursuits, Baltimore.

LEWIS TEBBETTS STEVENS. (F). Student of Medicine, Harvard University.

HERBERT THORNDYKE TIFFANY. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore. (15)

1883.

DOCTORS OF PHILOSOPHY.

WILLIAM JOHN ALEXANDER. (F). A. B., University of London, 1876.—Professor of English Literature, Dalhousie College, Nova Scotia.

WILLIAM CATHCART DAY. (F). A. B., Johns Hopkins University, 1880.—Professor of Chemistry and Physics, University of Nashville, Tennessee.

WILLIAM PITT DURFEE. (F). A. B., University of Michigan, 1876.—Professor of Mathematics, Hobart College.

GEORGE STETSON ELY. (F). A. B., Amherst College, 1878; Professor of Mathematics, Buchtel College, 1883–84.—Assistant Examiner, U. S. Patent Office.

KAKICHI MITSUKURI. (F). Ph. B., Yale College, 1879.—Professor of Zoölogy, University of Tokio, Japan.

BERNARD FRANCIS O'CONNOR. (F). Bach. ès Lettres, Université de France, 1874.—Instructor in French, Columbia College. (6)

BACHELORS OF ARTS.

WILLIAM SHIRLEY BAYLEY. Fellow, Johns Hopkins University.

MAURICE FELS. Student of Law, Philadelphia.

DAVID STERRETT GITTINGS. Student of Law, Baltimore.

WILLIAM BEATTY HARLAN. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore.

GEORGE THEOPHILUS KEMP. Fellow, Johns Hopkins University.

GONZALEZ LODGE. Fellow, Johns Hopkins University.

WILLIAM EDGAR STRATTON. Student of Medicine, Harvard University.

HENRY WINSLOW WILLIAMS. LL. B., University of Maryland, 1885.—Attorney at Law, Baltimore.

HENRY VAN PETERS WILSON. Graduate Scholar, Johns Hopkins University.

WILLIAM JOHN WITZENBACHER. Instructor in the McDonogh School. (10)

1884.

DOCTORS OF PHILOSOPHY.

HERBERT WILLIAM CONN. A. B., Boston University, 1881.—Professor of Zoölogy, Wesleyan University, Conn.

ELLERY WILLIAM DAVIS. (F). S. B., University of Wisconsin, 1879.—Professor of Mathematics and Military Tactics, Florida Agricultural College.

DAVID TALBOTT DAY. (F). A. B., Johns Hopkins, 1881.—Graduate Student, Johns Hopkins University.

JOHN DEWEY. (F). A. B., University of Vermont, 1879.—Instructor in Philosophy University of Michigan.

JAMES REYNOLDS DUGGAN. (F). A. B., Mercer University, 1877.—Fellow by Courtesy, Johns Hopkins University.

WILLIAM HENRY HOWELL. (F). A. B., Johns Hopkins, 1881.—Associate in Biology, Johns Hopkins University.

HANS CARL GÜNTHER VON JAGEMANN. (F). Naumburg Gymnasium, 1876.—Professor of Modern Languages, Earlham College.

EDWARD HARRISON KEISER. (F). S. B., Swarthmore, 1880.—Associate Professor of Chemistry, Bryn Mawr College, Pa.

ARTHUR LALANDE KIMBALL. (F). A. B., Princeton, 1881.—Associate in Physics, Johns Hopkins University.

HENRY LESLIE OSBORN. (F). A. B., Wesleyan, 1878.—Professor of Zoölogy, Purdue University, Indiana.

CHARLES ALBERT PERKINS. (F). A. B., Williams, 1879.—Assistant in Physics, Johns Hopkins University.

ALBERT SHAW. A. B., Iowa College, 1879.—Journalist, Minneapolis, Minnesota.

HENRY NEWLIN STOKES. (F). S. B., Haverford, 1879.—Student of Chemistry in Europe.

LEWIS WEBB WILHELM. (F). A. B., Johns Hopkins, 1880.—Baltimore.

ARTHUR YAGER. A. B., Georgetown College, Kentucky, 1879.—Professor of History, Georgetown College, Ky. (15)

BACHELORS OF ARTS.

ALBERT CLAYTON APPLEGARTH. Graduate Student, Johns Hopkins University.

CHARLES WALTER ARTZ. Student of Law, Columbia College.

WALTER BLISS CANFIELD. Graduate Student, Johns Hopkins University.

GEORGE GIBSON CAREY, JR. Student of Law, University of Maryland.

WILLIAM KENNEDY CROMWELL. Student of Law, Harvard University.

CHARLES WILLIAM RAMMELSBERG CRUM. Instructor in Mathematics, Mercersburg College, Pa.

HARRY FRIEDENWALD. Student of Medicine, College of Physicians and Surgeons, Baltimore.

WILLIAM LINDSAY GLENN. Student of Law, University of Maryland.

JOHN HINKLEY. Student of Law, University of Maryland.

CHARLES HOWARD HOWARD. Student of Law, University of Maryland.

JOHN DEERING LORD, JR. Student of Law, Columbia College.

JERE WILLIAMS LORD. Student of Medicine, University of Pennsylvania.

WILLIAM PATRICK LYONS. Student of Law, University of Maryland.

EDGAR GEORGE MILLER, JR. Student of Law, University of Maryland.

WILLIAM RIDGELY ORNDORFF. Graduate Scholar, Johns Hopkins University.

GEORGE DOBBIN PENNIMAN. Student of Law, University of Maryland.

WILLIAM HENRY PERKINS, JR. Student of Law, University of Maryland.

GEORGE CLEMENT STOKES, JR. Baltimore.

WILLIAM JONES THOMAS. (*Deceased, March* 9, 1885).

WILLIAM FERDINAND WALZ. Graduate Student, Johns Hopkins University.

FREDERICK HENRY WILKENS. Student in the University of Berlin, Germany.

GEORGE WISHART EDMOND, (*extra ordinem*). Graduate Student, Johns Hopkins University.

CHARLES HOWARD SHINN, (*extra ordinem*). San Francisco, California. (23)

1885.

DOCTORS OF PHILOSOPHY.

EDWARD WEBSTER BEMIS. A. B., Amherst College, 1880.—Instructor, Minneapolis, Minn.

GUSTAV BISSING. (F). A. B., Johns Hopkins University, 1882.—Assistant Examiner, U. S. Patent Office.

HENRY HERBERT DONALDSON. (F). A. B., Yale College, 1879.—Instructor in Psychology, Johns Hopkins University.

LOUIS DUNCAN. U. S. Naval Academy, 1880.—U. S. Navy.

HOMER WINTHROP HILLYER. (F). S. B., University of Wisconsin, 1882.—Assistant in Chemistry, University of Wisconsin.

FREDERIC SCHILLER LEE. (F). A. B., St. Lawrence University, 1878.—Student of Biology in Germany.

GUSTAV ADOLPH LIEBIG, JR. (F). A. B., Johns Hopkins University, 1882.—Fellow by Courtesy, Johns Hopkins University.

JAMES PLAYFAIR MCMURRICH. A. B., University of Toronto, 1879.—Instructor in Osteology and Mammalian Anatomy, Johns Hopkins University.

ALBERT GALLATIN PALMER. (F). A. B., Johns Hopkins University, 1882.—Assistant in Chemistry, Swarthmore College, Pa.

HARRY FIELDING REID. (F). A. B., Johns Hopkins University, 1880.—Student of Physics, University of Cambridge, England.

HENRY ALFORD SHORT. A. B., Columbia College, 1880.—Fellow of Columbia College.

MORRISON ISAAC SWIFT. (F). A. B., Williams College, 1879.—Ashtabula, Ohio.

HENRY ALFRED TODD. A. B., Princeton College, 1876.—Associate in Romance Languages, Johns Hopkins University. (13)

BACHELORS OF ARTS.

JOHN PENDLETON CAMPBELL. Graduate Scholar, Johns Hopkins University.

JOHN GLENN, JR. Student of Law, University of Maryland.

JUNIUS MOORE HORNER. Graduate Scholar, Johns Hopkins University.

JAMES ALBERT LOANE. Graduate Scholar, Johns Hopkins University.

HARRY WILBUR PRICE. Washington, D. C.

BENJAMIN TITUS ROBERTS, JR. Graduate Student, Johns Hopkins University.

MOSES ROTH RYTTENBERG. Graduate Student, Johns Hopkins University.

HUGO STEINER. Graduate Student, Johns Hopkins University.

HENRY HAZLEHURST WIEGAND. Graduate Student, Johns Hopkins University. (9)

TOTAL (1878-85).

DOCTORS OF PHILOSOPHY, ...	67
BACHELORS OF ARTS, ...	88

D.

Reports on the Studies of the Year.

PREPARED BY THE PROFESSORS AND INSTRUCTORS OF THE SEVERAL DEPARTMENTS.

MATHEMATICS.

The following courses of lectures, etc., have been given during the year:

Professor Newcomb:

Analytical and Celestial Mechanics. *Twice weekly, through the year.*
Seminary. *Weekly, second half-year.*

Dr. Story:

Seminary. *Weekly, through the year.*
Theory of Numbers. *Twice weekly, first half-year.*
Quaternions. *Three times weekly, second half-year.*
Modern Synthetic Geometry. *Three times weekly, first half-year.*
Modern Algebra. *Twice weekly, second half-year.*
Introductory Course for Graduates. *Daily, through the year.*
Conic Sections. *Twice weekly, through the year.*

Dr. Craig:

Seminary. *Weekly, through the year.*
Calculus of Variations. *Twice weekly, first half-year.*
Differential Equations. *Twice weekly, through the year.*
Theory of Functions. *Three times weekly, through the year.*
Hydrodynamics. *Three times weekly, first half-year.*
Linear Differential Equations. *Three times weekly, second half-year.*

Dr. Franklin:

Problems in Mechanics. *Twice weekly, through the year.*
Theory of Equations. *Three times weekly, first half-year.*
Differential and Integral Calculus. *Three times weekly, through the year.*
Solid Analytic Geometry. *Three times weekly, second half-year.*
Analytical Geometry. *Twice weekly, first half-year; three times weekly, second half-year.*
Trigonometry. *Three times weekly, first half-year.*

Mr. Nixon:

Differential and Integral Calculus (specially designed for students of Physics). *Daily, first half-year.*

PHYSICS.

The rooms devoted to the Physical Laboratory have been open daily for the prosecution of study and research, under the direction of Professor Rowland, assisted by Drs. Kimball and Perkins.

A photographic map of the spectrum has been nearly completed, and special preparations have been made for the exact measurement of wave lengths. These preparations have involved the construction of a comparator, a fine micrometer, and a spectrometer with telescopes having six and a quarter inch objectives and eight feet focal length.

The following researches have also been carried on during the year:

The investigation of displacement currents by electro-magnetic means.

The determination of the expansion of water between zero and forty degrees centigrade.

The preparation and study of standard cells.

The measurement of wave lengths of light in absolute measure.

During the month of October a course of twenty lectures on *Molecular Dynamics* was given by Sir William Thomson, D. C. L., F. R. S., &c., Professor of Physics in the University of Glasgow. These lectures were especially intended to develop the mechanics of the molecule in its relations to the luminiferous ether, and were attended by a number of professors and special students of physics from all parts of the country. Stenographic notes of the lectures were taken by Mr. A. S. Hathaway, and have since been written out and published.

Advanced students have taken part with the instructors in weekly meetings for the discussion of the current physical journals.

The following courses have also been carried on during the year:

Professor Rowland:

Lectures on Electricity and Magnetism. *Four times weekly, through the year.*

Dr. Kimball:

First year's course in General Physics. *Daily, through the year.*
Elementary Thermodynamics. *Weekly for eleven weeks.*
Theory of Electricity. *Twice weekly for ten weeks.*
Physical Optics. *Twice weekly for ten weeks.*

Dr. Perkins:

Laboratory work of the undergraduate students throughout the year.

Chemistry.

Advanced students have been engaged daily in the laboratory in prosecuting such work as seemed best adapted to the purposes of each. Those who have completed the full courses in General Chemistry, including from two to three years' work in qualitative and quantitative analysis and about a year's work in making difficult and instructive preparations, were encouraged to undertake the solution of original problems.

The following investigations have been in progress during the year:

On chemical action in a magnetic field.

The effect of pressure on the transformation of a diazo-compound by boiling with alcohol.

The structure of benzoic sulphinide.

On para-brom-benzoic sulphimide.

On the relative stability of halogen derivatives of the paraffins in the presence of an alkali.

A method for the estimation of zinc dust.

An apparatus which enables students to determine the equivalents of certain metals.

An apparatus for distilling mercury in a vacuum.

The results of these investigations have either been already published or will soon appear in the *American Chemical Journal*. Some of them have been read before the Johns Hopkins Scientific Association at its regular meetings.

The Fellows and other advanced students have met the instructors twice a week during the year for the purpose of keeping abreast of the current

chemical literature. All the important journals have been carefully read, and full reports of the various articles have been made.

These students have been often called upon to treat important chemical questions in a broad way, going to the original sources and presenting the results in a complete form. In most cases the topics so investigated have been connected with the experimental work going on at the time; but other questions also have been elaborated in this way, which bore less directly on the current studies. In several cases carefully written reports of the results obtained have been prepared. The excellent library of chemical books and journals which is accessible to the students in the laboratory, at all reasonable hours, has greatly facilitated the execution of this very desirable literary work.

At the beginning of the year subjects were assigned to the Fellows and others for the preparation of lectures on various chemical topics treated historically; and sixteen such lectures were the result. These were prepared from a careful study of the original articles in the journals and were not borrowed from books on the history of chemistry. Full abstracts of these lectures, furnished with complete references to the articles consulted, are to be prepared and preserved in the chemical library. The lectures given were as follows:

Two by Professor Remsen on The Basicity of Acids;
One by Dr. J. R. Duggan on Disinfecting Agents;
One by Mr. W. S. Bayley on The History of Uric Acid;
Two by Dr. D. T. Day on Dissociation;
One by Mr. C. S. Palmer on The Proust-Berthollet Controversy;
Two by Dr. Morse on The History of Phosphorus;
One by Mr. A. G. Palmer on Isomerism in the Benzene Series;
One by Mr. H. W. Hillyer on Homology;
Two by Dr. E. H. Keiser on The History of Pyridine and Quinoline.

These lectures were attended by an average of twenty-five persons including the instructors.

In addition, the work of the year has consisted of the courses below mentioned:

Laboratory Work through the entire year, conducted by Professor Remsen, Dr. Morse and Dr. E. H. Keiser.
Lectures by Professor Remsen:
General Chemistry, *daily, first half-year.*
Chemistry of the Compounds of Carbon, *daily, second half-year.*
Chemical Philosophy, *twelve lectures, first half-year.*
Courses by Dr. Morse:
Analytical Chemistry, *four times weekly, first half-year.*
General Chemistry, *three times weekly, second half-year.*

MINERALOGY AND PETROGRAPHY.

Courses of lectures have been given by Dr. G. H. Williams on:

Inorganic Geology, Petrography, and General Mineralogy. *Three times weekly.*
Elementary Mineralogy, *twice weekly, second half-year.*

Daily laboratory instruction has also been given in microscopical petrography and physical mineralogy.

Frequent excursions have been made and considerable material for a geological map of the vicinity of Baltimore has been brought together; much information as to the number and range of the minerals occurring within this district has also been collected.

Special and detailed microscopic studies have been made of the basic massive rocks (hypersthene- and olivine-gabbros and peridotites) occurring near Baltimore, as well as of the molecular and chemical changes which these have undergone.

Considerable microscopic work has also been done on the interesting massive rocks occurring near Peekskill, N. Y., which have been called by Prof. J. D. Dana the "Cortlandt Series."

Biology.

The Biological Laboratory has been open for eight hours daily during the year, for the prosecution of advanced study and research and for courses of practical instruction in connection with class lectures.

During the year original investigations have been made in regard to the following subjects:

The proteids of blood plasma. The influence of intermittent pressure on arterial tonicity. The influence of various salts on arterial tonicity. The absolute relative value of commercial disinfectants and germicides. Regeneration of tissue in larvæ. The rate of propagation of the wave of muscular contraction. The proximate cause of the coagulation of blood. The functions of the cardiac nerves of the Chelonia. The nature of aphœa. The embryology of Echinoderms. The conditions which determine sex. The embryology of insects. The segmentation of the vertebrate skull. The homology of the hypoglossus nerve.

Preliminary notices of the results of most of the above researches have already been printed in the *University Circulars*, in the *Zoologischer Anzeiger* and elsewhere. Fuller accounts will shortly be published.

In connection with the regular class instruction, first year students studied a number of typical fungi, green plants, and animals; the skeletons of about twenty selected vertebrates; and the development of the chick in the egg. In the spring there were twelve practical lessons in the elements of Systematic and Descriptive Botany.

Second year students worked at the histology of the tissues and organs of the higher vertebrata (especially man); the physiological properties and functions of the tissues and organs; the physiology of digestion; the chemistry of bile, urine, etc. The cat and about twenty-five selected invertebrate and vertebrate types were thoroughly dissected by the second year students.

Dr. W. K. Brooks lectured twice weekly through the year on Advanced Morphology.

A course of seven lectures on Morphological Problems was given during April and May, as follows:

Three by Mr. E. A. Andrews on the Anatomy, Embryology, and Affinities of Annelids;
One by Dr. J. Playfair McMurrich on the Morphological Significance of the Hypoglossus Nerve;
One by Mr. A. T. Bruce on the Embryology of Insects;
One by Mr. Otto Lugger on Galls;
One by Dr. W. K. Brooks on Alternation of Generations.

A course of six lectures on Animal Teratology was given by Dr. W. T. Councilman during May.

Most of the advanced work was carried on individually, and not in class; each worker taking up some special topic for study under the immediate direction of some one of the instructors. In addition to the original researches already enumerated, certain graduate students have in this manner carried on advanced study in various directions.

Students engaged in this kind of study (which forms a stepping-stone between class-work and original research), are usually given some important original article, and shown how to repeat and verify for themselves (and

criticise) the experiments and results described in it. By studying and repeating the original work of others they learn the methods of biological investigation, and are thus trained to plan and carry out researches themselves. In connection with this work, students are also taught how to hunt up and utilize the bibliography of a subject.

Courses of lectures for undergraduates were given as follows:

Osteology, *twice weekly, until the end of March.*
Mammalian Anatomy, *twice weekly, until Christmas.*
Animal Physiology and Histology, *three times weekly, through the year.*
General Biology, *three times weekly, until the end of March.*
General Zoölogy, *from Christmas to end of the year.*
Embryology of the Chick and Mammal, *three times weekly, from the first of April until the close of the session.*
Plant Analysis, *twice weekly, in April and May.*

During the summer of 1885, the Chesapeake Zoölogical Laboratory for the study of forms of marine life was open at Beaufort, N. C., from May 23 to Sept. 15.

The advanced work included original investigations on the following subjects:

The embryology of Limulus polyphemus; the chemical composition and coagulation of the blood of Limulus polyphemus, Callinectes hastatus, and Cucumaria sp.; the presence of haemoglobin in the Echinoderms; the existence of a post-oral band of cilia in Gasteropod Veligers; the rhythm and innervation of the heart of the Sea Turtle; the physiology of the heart of the Alligator; the cardiac rhythm of Fishes and the action on the same of certain drugs and poisons; origin of the endoderm in Lepidoptera; the artificial propagation and cultivation of Oysters in floats; the Stomatopoda.

GREEK.

Under the direction of Professor Gildersleeve the advanced students of Greek have been organized into a Greek Seminary. According to the plan of the seminary, the work of each year is concentrated on some leading author or some special department of literature. During the past year the work has been in the Attic Orators.

In the seminary proper, which met twice a week during the academic year, the orators chiefly studied were Antiphon, Andokides, Lysias, Isaios, and Demosthenes. Especial attention was paid to the development of language and style and to the antique canons of aesthetic criticism. The members were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to make analyses of speeches and abstracts of rhetorical treatises.

Of the investigations carried on may be noted: The phraseology and syntax of the fifth oration of Antiphon, the style of Andokides' third as compared with the first and second orations, Thrasymachos of Kalchedon, comparative study of the Trapezitikos and Aiginetikos of Isokrates, synonyms in the orators, the use of the participle in Greek lyric poetry, on the language of the oracles especially in Herodotos, special studies in the vocabulary of Dionysios.

The work of the seminary was supplemented by the study, with critical exercises, under the guidance of the Director, of the rhetorical works of Dionysios of Halikarnassos, and by a course of lectures on the History of Greek Oratory.

Besides the seminary course proper, Professor Gildersleeve delivered twenty-three lectures on Greek Syntax, conducted twenty-two exercises in

translating at dictation from Greek into English and English into Greek, and gave a course of twenty lectures on Lyric Poetry. He also conducted a series of sixteen conferences in Greek Grammar for undergraduates.

Mr. Harris conducted class courses in New Testament Greek (three times weekly, first half-year, and five times weekly, second half-year), and in Sub-Apostolic Literature (three times weekly through the year); and gave a course of eight public lectures on the Perpetuation of Ancient Manuscripts.

Classes were conducted by Dr. Emerson in Classical Archæology (weekly through the year), in the Attic Judicial System (weekly, second half-year), and in the History of Ancient Art (twice weekly, second half-year).

Additional courses were conducted by:

Professor C. D. Morris, in

Plato, *Gorgias, four times weekly, first half-year.*
Aeschylus, *Persae;* Euripides, *Iphigenia in Tauris, three times weekly, second half-year.*
Reading at sight.

Dr. Spieker, in

Isocrates, I, IV; Xenophon, *Hiero, four times weekly, first half-year.*
Homer, *Iliad,* XVI–XVII; Euripides, *Hercules Furens, four times weekly, second half-year.*
Classes in Greek Prose Composition were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Herodotus, *Merry's Selections,* (6).
Homer, *Odyssey,* XXI-XXIV, (6).
Xenophon, *Oeconomicus,* (7).
Plutarch, *Themistocles, Cicero,* (6).

Latin.

The Latin Seminary, under the direction of Dr. Warren, held two sessions a week throughout the year, the authors forming the centre of work being the Roman Satirists, especially Horace and Juvenal.

Some of the Fragments of Lucilius were read and discussed, select Satires of Horace and Juvenal were interpreted by the members of the Seminary, in turn, and papers were read by them embodying the results of special studies. Among the subjects thus treated were Juvenal's use of the gerund and gerundive; words borrowed from the Greek used by Horace and Juvenal; the use of the conjunction *cum* in Juvenal; the conditional sentence in Juvenal; the *sermo familiaris* as seen in Lucilius, Horace, Persius, Juvenal, and Petronius; the use of certain suffixes in Plautus, Terence, Lucilius, Horace, Persius, and Juvenal; the future active participle in Juvenal; the position of adjectives with respect to their substantives in Horace; the so-called Sulpiciæ Satira; the use of the preposition *de* in Juvenal; the differences existing between the Satires and other works of Horace; some peculiarities of the Horatian Hexameter based upon statistics collected by members of the Seminary.

In connection with the Seminary work, Dr. Warren gave a course of weekly lectures during the first half of the year on the Roman Satirists. In the latter half of the year Dr. Warren conducted a weekly course of Practical Exercises in Latin.

Additional courses have been conducted during the year by:

Dr. Warren, in

Plautus, *Mostellaria,* and Terence, *Andria, three times weekly, first half-year.*
Tacitus, *Agricola, Germania, Annals,* I, *three times weekly, second half-year.*
Reading at sight, *weekly, throughout the year.*

Professor C. D. Morris, in

Cicero, *de Oratore* I, *Tusculan Disputations* I, *three times weekly, first half year.*
Catullus and Martial, *Select Poems, three times weekly, second half-year.*
Reading at sight, *weekly, throughout the year.*

Dr. Spieker, in

Livy, II, III, *four times weekly, first half-year.*
Horace, *Select Odes, Satires, and Epistles, four times weekly, second half-year.*
Classes in Latin Prose Composition, meeting weekly, were also conducted by each of the instructors in connection with the courses above named.

Students have privately read for examination the following books:

Cæsar, *Bellum Civile*, (9).
Cicero, *de Senectute*, (1); *de Amicitia*, (9); *Tusculan Disputations*, II, (2); *Orator*, (2).
Horace, *Epodes*, *Carmen Sæculare*, (12).
Livy, V, VI, (1).
Ovid, *Fasti*, I, II, (12); *Selections*, (1).
Plautus, *Captivi*, (3).
Pliny, *Select Letters*, (2).
Tacitus, *Agricola*, *Germania*, (1); *Histories*, I, (1); *Annals*, III, IV, (6), IV, V, (1).
Terence, *Phormio*, (3).

SHEMITIC LANGUAGES.

The work of the past year was essentially a continuation of the courses begun during the session 1883–84. For beginners the only course given was in elementary Hebrew. The course in the elements of Biblical Aramaean presupposed a thorough knowledge of Hebrew. The Shemitic studies again centred in the Old Testament on which at first five, and later four, lectures a week were given.

In the *Hebrew course for beginners* the essential elements of the grammar were acquired (after Gesenius-Kautzsch's Hebrew Grammar translated by E. C. Mitchell) and then the reading of the Pentateuch was entered upon.

In the *Hebrew Exercises* about forty chapters from the historical books of the Old Testament were read at sight: Exodus, 16; Genesis, 11 and 12; Jonah, 1 and 3; Job, 1 and 2; Exodus, 3 and 4; Judges, 19 and 20; 2 Samuel, 11; Numbers, 22; Judges, 11; 1 Kings, 17; Exodus, 31 and 32; 2 Kings, 19–21; Deuteronomy, 34, and Joshua, 1–2; Nehemiah, 1 and 2; Jeremiah, 37 and 38; 1 Samuel, 13; 1 Kings, 12 and 13; 1 Chronicles, 10, and 1 Samuel, 31, and 2 Samuel, 1; 2 Samuel, 12; Judges, 6; Ruth, 1 and 2; 1 Kings, 1 and 2; Nehemiah, 8 and 9.

In the *Critical Interpretation of Selected Psalms*, Psalms, 23 and 1, and especially the fifteen post-exilic so-called Songs of degrees (Ps., 120–134) Hebrew *Shirê hamma'alôth*, *i. e.*, the Songs of the Return (from exile) were thoroughly explained and critically analyzed, with special attention to textual criticism, date of authorship, and constant comparison with the ancient versions of the Psalter.

In the course in the *Elements of Biblical Aramaean* the forms were studied after the paradigm-tables in Baer and Delitzsch's edition of *Libri Danielis, Ezrae et Nehemiae* (Leipzig, 1882) and the first chapters of the book of Daniel read. This course was especially intended as a preparation for the study of Syriac.

In *Arabic* there was read the anecdote of a man of Baghdâd and his slave girl from the *Kitâb tazyîn el-aswâq* (Kosegarten's *Chrestomathia Arabica*, p. 22; Petermann, *Brevis linguae Arabicae grammatica*, p. 33; cf. Lane, *The Thousand and One Nights*, Vol. III, p. 524), and then extracts from the Travels of Ibn Baṭûṭah in the first volume of the Beyrut Arabic Chrestomathy *Majânî-el-adab* (Beyrut, 1883, Imprimerie Catholique); No. 302, The sheikh Abdallah and the elephants; No. 309, The wagons in the Crimean (*Qiffaq*) Steppes; No. 313, Ibn Baṭûṭah's journey to the city of Bolgary; No. 344, Ermine and Sable; No. 320, Meteorites, and finally No. 314, Ibn Baṭûṭah's journey to China and his suffering in captivity. In addition the class met two hours weekly to read easy Arabic

texts at sight, under the guidance of Dr. A. L. Frothingham, Fellow in Shemitic Languages; selections from the Chronicles of Abulfaraj, fables, anecdotes, etc., were read.

In *Ethiopic* the whole book of Baruch in Dillmann's *Chrestomathia Aethiopica* was explained. This was preceded by a series of lectures on the grammar of the Geez language.

In *Assyrian* a course of lectures was first given on Comparative Assyrian Grammar, after which the cuneiform account of the campaign against the Arabians in the Annals of King Sardanapalus (B. C. 668–626) was studied. This was read and explained from beginning to end (V R. 7, 82–10, 5).

In *Sumero-Akkadian* the Syllabaries and Vocabularies in the first part of Haupt's *Keilschrifttexte* were finished, besides the Akkadian Incantation No. 9, and the Sumerian Penitential Psalms No. 14 in Haupt's *Texts*, and finally the Sumero-Akkadian Family Laws (V R., 24).

All the courses were one hour a week through the year with the exception of Elementary Hebrew, Ethiopic, and Assyrian, to which in turn two hours a week were devoted.

Sanskrit and Comparative Grammar of the Cognate Languages.

During the session the following courses were conducted by Dr. Bloomfield:

1. *Elementary Sanskrit.* The most essential elements of the grammar of the classical language were acquired in as short a time as possible, and then the students were brought face to face with the language, learning its structure and laws, not in the abstract, but in its living body. This course served especially, as was found by practical experience, to furnish the students with a knowledge of grammatical analysis, clearer and more exact than that which they bring with them from other philological pursuits. This is due partly to the unrivalled transparence of the structure of the language, and partly to the tradition which has kept alive a close bond between Sanskrit and Comparative and Historical Grammar. Five books of the *Nala* and about a dozen selections from the *Hitopadeça* (both in Lanman's Reader), were read and thoroughly analyzed.

2. A second class in Sanskrit was conducted through a rapid course of reading in the *Hitopadeça* and *Kathâsaritsâgara*.

3. The advanced class in *Vedic Sanskrit* began with a short course in the *Brâhmaṇas*, restricting themselves to the characteristic selections in Lanman's Reader, which were thoroughly analyzed. The greater part of the year was devoted to an introduction into the *sûtra*-literature, and the relation of the *sûtras* to the hymns of the *saṃhitâs*. Selections from *Âçvalâyana's gṛhyasûtras*, including the hymns cited in them, were read, and their bearing upon Indian life and literature in general was discussed. A series of selections from the law book of *Manu* closed the work of the year.

4. A course in the *general principles of Comparative Philology* was carried on throughout the year. It was introduced by twelve lectures on the leading questions of Indo-European Comparative Grammar (*phonetic law and analogy, agglutination, the questions attaching themselves to the relationships of languages*, etc.). During the remainder of the year Professor Whitney's "Language and the Study of Language" was made the basis of instruction, but this was constantly supplemented by lectures, which aimed to advance the subjects treated in the book up to the present day.

5. A course in *Comparative Grammar of Greek.* This was devoted especially to a detailed exposition of the latest theories on *Indo-European vocalism*, and to a practical application of them to the body of the Greek language. Incidentally other important chapters of Greek Grammar, especially the *gutteral series of consonants* and *questions on accentuation*, were treated. The most important phenomena in the vocalism of the principal related languages, Latin, Gothic, and Sanskrit, were also presented.

German.

Dr. Wood conducted the following advanced courses:

Gothic. *Twice weekly, first half-year.* The selections from Ulfilas in Braune's grammar were read and explained. A historical and critical introduction to the study was given, together with four lectures on the history of the Gothic declensions, and four on Gothic syntax.

Old High German. *Weekly, first half-year; twice weekly, second half-year.* The following parts of Braune's reader were read: Nos. 4, 5, 9, 16 (Tatian), 17 (the Strassburg Oaths), 28 (Hildebrandslied), 29, 30 (Muspilli), 31, 33, 34, 35, 36, 39, 40, 41, and part of 32 (Otfrid). Seven lectures were given on the High German Mutation of Consonants.

Middle High German. *Weekly, through the year.* Paul's Grammar (second edition) was used. Selections (about half) from Walter von der Vogelweide (Wilmann's second edition), and one-third of Hartmann's *Iwein* (ed. Benecke-Lachmann) were read. Four lectures were given on Middle High German Metre.

German Comparative Grammar. (Lectures). *Weekly, second half-year.*

The undergraduate courses were conducted by Dr. Wood and Mr. Hempl, as follows:

Major Course:

German Literature. Lectures. *Weekly.* DR. WOOD.

Goethe: *Hermann and Dorothea; Faust I. Twice weekly.* MR. HEMPL.

Selected Readings. Masius. *Lesebuch III. Weekly.* DR. WOOD.

Prose Composition. *Weekly.* DR. WOOD.

Exercises in German Style. *Monthly.* DR. WOOD.

Minor Course:

Lessing: *Minna von Barnhelm, Prosa.* Goethe, *Prosa.* (*Two sections*). *Twice weekly.* MR. HEMPL.

Selected Readings. Oltrogge; *Lesebuch II.* (*Two sections*). *Twice weekly.* DR. WOOD and MR. HEMPL.

Prose Composition. *Weekly.* MR. HEMPL.

Oral Practice. *Weekly.* DR. WOOD.

A class in German conversation was conducted by Dr. Gerber, daily, through the year.

Supplementary Classes:

First Section: Brandt's Grammar, Deutsch's Reader. Schiller: *Lied von der Glocke* (ed. Otis). *Three times weekly.* MR. HEMPL.

Second Section: Otis: Elementary German. Ludwig: *Schloss Heimburg. Five times fortnightly.* MR. HEMPL.

ENGLISH.

Advanced courses were conducted as follows:

Anglo-Saxon: Bēowulf. *Weekly.* DR. WOOD. Seven lectures on Germanic Mythology were given with this course.

Anglo-Saxon Grammar. Lectures. *Twice weekly, during March, April, and May.* DR. J. W. BRIGHT.

Additional classes, including the first and second year's courses for undergraduates were conducted as follows:

The minor (first year's) course was directed by Dr. Browne. The first half-year of this course was devoted to the Elizabethan writers. The work included a study of the period and its influences, the prose-writers, lyrists, and allegorical writers, and the rise and development of the drama. Shakespeare's *Julius Cæsar* (Clark and Wright's edition) was carefully studied as class-work. The later Elizabethan drama was illustrated by Webster's *Duchess of Malfy*, and Fletcher's *Rule a Wife*. Abbott's *Shakespearian Grammar* was recommended for reference. The second half-year was employed in the study of fourteenth century literature. Texts studied in class were Chaucer, *Nonne Prestes Tale* (ed. Morris) and Langland, *Piers the Plowman*, Passus 1–3, 5–6 (Skeat's edition), and the period was further illustrated from Wyclif, the pseudo-Chaucer, and *Pierce the Ploughman's Crede.*

The major (second year's) course included instruction in Anglo-Saxon with Mr. C. B. Wright, twice weekly, through the year; Sievers' *Grammatik*, Sweet's *Reader*, and Cynewulf's *Elene* (ed. Zupitza) were used as text-books. Mr. A. E. Egge also conducted a class in Early English, twice weekly, through the year; Skeat's *Tale of Gamelyn*, and Morris's *Specimens of Early English, Part I*, were read.

The work in English done in the P. H. E. course (required of all undergraduates) was conducted by Dr. Browne and was directed with the view of giving the matriculates a sound general conception of the whole body of English literature from the earliest times down to the present century. No manual was used, the students being brought into contact with the original texts, except in the case of writers earlier than the fourteenth century, where the examples selected for illustration were modernized by the instructor. The class read aloud, under the instructor's guidance, Chaucer's *Prologue* and *Knightes Tale* (Morris's edition), and Shakespeare's *Hamlet*. The ground covered by the course extended from *Beowulf* to Burke.

Courses of public lectures were given on:

English Poetry and the Poet Gray, by Mr. Edmund Gosse. (8).
Shakespeare, by Professor Hiram Corson. (20).
Phonetics, by Mr. A. Melville Bell. (7)
Shakespeare Bibliography, etc., by Mr. Justin Winsor. (2).
Shakespeare (Readings), by Mr. D. C. Bell. (2).

A Shakespeare Circle was formed under the general guidance of Dr. Browne and Dr. Wood, and held several conferences through the session.

Romance Languages.

Advanced courses were conducted as follows:

The Romance Seminary, under the direction of Mr. Elliott. *Two hours a week through the year.*

The work was concentrated on three of the earliest Old French monuments, namely, the *Cantilène de Sainte Eulalie*, *Fragment de Valenciennes* and part of the *Passion du Christ*. The examination of these texts was on MS. fac-similes and bore upon both matter and form. In addition to it a Seminary meeting was held once a week in which all special students of this department took part.

Introduction to Old French Philology. *Aucassin et Nicolète* was critically studied with special reference to its phonology and morphology as compared with the Classic Latin, on the one hand, and with the Modern French on the other. *Weekly through the year.*

Wallachian:—The whole of Cionca's *Practische Grammatik der rumänischen Sprache* was worked through and short poetical extracts read from Alexandri, Alesandrescu, Muresianu and Sionu. *Weekly, second half-year.*

Lectures:—(*a*) On the Langue d'Oïl Dialects. The object of this course was to give the leading characteristics of the chief dialect groups that constitute the North French.
(*b*) The History of Romance Studies in Europe. *Weekly.*
(*c*) Comparative Romance Phonology. *Weekly.*
(*d*) Modern French Phonetics. *Weekly.*
(*e*) The History of the Past Participle in French. *Three Lectures.*

The undergraduate courses were as follows:

The students of the French Major Course read with Dr. Todd: In Bartsch's Chrestomathie, the selections from *Les plus anciens monuments, St. Alexis, Amis et Amiles, Bestiaire de Philippe de Thaün, Mystère d'Adam, Tristran, Roman de Rou, Contes del Graal, Sermon de Saint Bernard, Roman de Renart, Roman de la Rose, Villehardouin, Froissart, Philippe de Comines, Perceforest;* and the whole of the Oxford text of the *Chanson de Roland.*

Dr. Todd also gave, in this course, seven lectures on the French Literature of the Middle Ages.

The students of the French Minor Course read with Dr. Todd: *Le Voyage autour de ma Chambre* by Xavier de Maistre, *Les Jumeaux de l'Hôtel Corneille* by Edmond About, *Les Mésaventures d'un Ecolier* by Töpffer, *Le Barbier de Séville* and the *Lettre critique sur le Barbier de Séville* by Beaumarchais, and *Hernani* by Victor Hugo. Twenty-minute talks on French Literature upon the basis of Saintsbury's *Primer* have been given in connection with the above readings; with Mr. Bowen they read 110 pp. of Montesquieu, *Grandeur et Décadence des Romains*, 75 pp. of Masson, *French*

Classics, Vol. VII., (Memoirs of 17th Century); 100 pp. of Milne-Edwards, *Précis d'Histoire Naturelle*, and in connection with this, studied 150 pp. of Breymann's *French Grammar;* with Mr. Fontaine they studied and prepared written exercises on the whole of Part I. and fifty *thèmes* of Part II. in Chardenal's Exercises for Advanced Pupils.

Mr. Fontaine met the students of the Minor Course five times weekly for French conversation with systematic instruction and drill in pronunciation.

Dr. Todd has conducted special courses in Italian, Spanish, Catalan, Old Provençal Modern Provençal, and Portuguese:—The class in Italian have read the following authors. Goldoni: *Gl' Innamorati;* Manzoni: *I Promessi Sposi* (one hundred pages); Machiavelli: *Istorie Fiorentine* (second book); selections from Leopardi; and a short *Storia della Letteratura Italiana.* Exercises in grammar have been given twice weekly in connection with the above.

The class in Spanish read the following: Knapp's Spanish Readings (one hundred and fifty pages); *El Barómetro* (comedia); *Don Quijote* (ten chapters); and 1200 verses of the *Poema del Cid* (XII Century). Exercises in grammar were given twice weekly.

In Catalan the *Cronica* of Ramon Muntaner, Chapters VI. to XXVII. (Cardona's *Dell' Antica Letteratura Catalana*), was read.

In Old Provençal were read the *Poème sur Boèce;* selections from *Girart de Rossilho*, from the poetry of Marcabrun, Bernart de Ventadorn, and Peire d'Alvernhe; and all the prose of Bartsch's Chrestomathie. In Modern Provençal, three cantos of Mistral's *Mirèio* were critically studied.

The class in Portuguese have read three cantos of Camoen's *Lusiads*, and numerous selections from Braga's *Antologia Portugueza*, covering the most ancient period of the language.

Ten public lectures on Romance Literature were given in Hopkins Hall. Three of these by Dr. H. A. Todd, on *Contemporary Spanish Literature*, embraced: I, Contemporary Poetry in Spain; II, The Modern Spanish Novel; III, The Orators and Drama of Modern Spain. Seven lectures, by Associate Professor Elliott, on *Camoens*, covered: I, II, Sketch of Portuguese History to the Death of Camoens; III, Life of Camoens; IV, Minor Works of Camoens; V, VI, The Lusiads; VII, Camoens at Home and Abroad in the Nineteenth Century.

Two public courses on French Literature, including twenty-five lectures and readings (in French) were given by M. Rabillon.

HISTORY AND POLITICAL SCIENCE.

The Seminary of History and Politics, under the direction of Dr. H. B. Adams, has met once a week during the past academic year, each session occupying two hours. Attention has been confined to select topics of American Institutional and Economic History.

Dr. Adams conducted a class course for graduates in the History of Politics, three hours a week through the year.

The course consisted of (1) lectures by Dr. Adams, upon Greek, Roman, and Mediæval Theories of Politics, supplemented by student-reports on Modern Political Theories; (2) oral examinations upon Greek politics, historically considered; (3) lectures upon Modern European Politics, supplemented by the exposition of Bluntschli's *Lehre vom Modernen Stat.*

To undergraduates, Dr. Adams gave the following courses of instruction:

1. Fifteen introductory lectures on Ante-Classic History, with Keary's Dawn of History and Clodd's Childhood of Religions for text-books.
2. Two hours a week through the year on Church History in its relations to the Roman and German Empires, followed by lectures on the Italian Renaissance. The text-books employed were Ploetz's Epitome of Mediæval History and Bryce's Holy Roman Empire, with required readings in Gibbon's Decline and Fall of the Roman Empire

and Milman's Latin Christianity. Two historical essays were required from each member of the class.

3. Two hours a week through the year on the History and Elements of International Law, a course consisting of lectures, the exposition of Bluntschli's *Moderne Voelkerrecht der Civilisirten Staaten*, and reports by members of the class upon international topics. This course, with Dr. Jameson's three hours a week on the English and American Constitutions, constituted the second year in Politics.

Dr. R. T. Ely gave the following courses to graduate students:

1. Two lectures a week on Finance and Taxation. This course comprised an exposition of the general principles and history of money, banking, and finance, also the special subject of taxation in the Cities and States of the American Union, and a sketch of the financial history of the United States. Papers were prepared by members of the class, and class discussion was continually encouraged.
2. One lecture was given each week throughout the first half-year on the principles and historical growth of Commerce. It is hoped that this course will lead to original investigations in the History of American Commerce.
3. One lecture weekly was given throughout the second half-year on methods of Administration in England, Germany, and France. The special subjects treated were the organization of government, bureaucratic and self government, economic functions of government, sanitary legislation, poor laws, appointment and tenure of office, etc.

To undergraduate students, Dr. Ely gave a course of class instruction, five hours a week through the year.

This comprised the first year in the course on Political Science. The first term was devoted to the Elements of Political Economy; the second, to the History of Political Economy. Essays upon assigned topics were required from all members of the class.

Dr. J. F. Jameson conducted class courses as follows:

1. In Physical and Historical Geography (twenty exercises); in the History of Greece down to the time of the Roman conquest, and in the History of Rome and of the Roman Empire down to the fifth century A. D., two hours weekly through the year. The text-books employed were Tozer's Classical Geography, Fyffe's Greece, and Leighton's Rome.
2. In the History of France and England, employing as text-books the Student's History of France and Green's Short History of the English People. Three essays were required. This course, three hours weekly through the year, was in connection with Dr. Adams' class course of two hours a week on Church History, German Empire, and the Italian Renaissance.
3. In the second year's course in Politics, devoting three hours a week to the Constitutions of England and the United States, and using for that purpose two volumes in the English Citizen Series,—Walpole's Electorate and Legislature and Traill's Central Government,—also Bagehot's treatise on the English Constitution, and selections from the principal authorities upon the Constitutional Development of the United States.

Psychology, Pedagogics, History of Philosophy, etc.

Professor G. Stanley Hall lectured twice weekly through the year on Psychology.

This course was in the main a continuation of the course begun the previous year, which was on the psycho-physics of the senses. The lectures began by describing the recent methods and results in the study of instinct. The topics of psycho-genesis, disorders of speech, illusions, the psychological aspects of insanity, localization studies in spinal cord and brain, psycho-physic time and the time sense, apperception and will, and psychological anthropology, were treated with charts, illustrations and literature.

Four students were engaged in original psycho-physic research, the results of which will be made public in due time.

Two weekly conferences were held by Professor Hall during the last half-year, one devoted to ethics, and the other to scientific topics in psychology.

Professor Hall lectured once weekly through the year on Education. Student life and societies and customs in the middle ages introduced the history of the Italian, French, English and German universities, their organization and legislation, courses of study, &c. Then followed a sketch of the development of primary and secondary State and private schools, their organization, relation to the State, courses of study, with a detailed account of the work in a typical gymnasium, real-school, and French and English schools of a similar grade. The educational ideas of Comenius, Sturm, Locke, Montaigne, Herder, Pestalozzi, Rousseau, Kant, Niemeyer, Schwartz, Graser, Schleiermacher, Herbart, Waitz, Beneke, and contemporary writers were epitomized. The development of modern methods in a few cardinal branches of common school study was given with many illustrations. The history of English and Prussian school legislation was outlined, and the unfoldment and present condition of industrial education in the different countries was sketched. Classical, female, professional education, were treated historically, and the course concluded with an account of the institution and philosophical ideals of education in ancient Greece.

A course of twelve lectures on educational topics was given on Saturday mornings to a company of about one hundred graduate students. Lectures were given by President Gilman, and by these members of the academic faculty: Messrs. Hall, Newcomb, Bloomfield, Brooks, Craig, Elliott, Ely, Harris, Hartwell, Story, and Warren.

A few lectures were given by Professor Hall on Mental Hygiene to the undergraduate students.

Professor G. S. Morris gave the following courses:

History of Philosophy in Greece. *Twice weekly, first half-year.*

Topics involved:—The beginnings of science. Anticipations of the modern doctrine of development. Establishment of elementary conceptions of physical science. First application of mathematical conceptions to the comprehension of the universe. Beginnings of abstract speculation. First successful development of concrete or substantial idealism, including science of method (logic), and philosophy of nature, man, the State, art, and education. Systems of practical philosophy.

Ethics, or the Science of Man. *Two lectures weekly, first half-year.*

A consideration of the foundations and content of ethical science, together with an historical survey.

E.

Report of the Chesapeake Zoölogical Laboratory.

SESSION OF 1885.

To the President of the Johns Hopkins University:

SIR: In accordance with your request, I have the honor to submit to you the following report of the eighth session of the marine laboratory of the University.

The laboratory was opened at Beaufort, N. C., on May 23, and it was occupied for research until September 15, or a little more than sixteen weeks. Its facilities were used by twelve investigators, and as the house which we have occupied for several years at Beaufort is too small to accommodate so large a party, I should have been forced to refuse to receive some of them if it had not fortunately happened that the only large house near the laboratory and suitable for our use was vacant this summer. I, therefore, rented it, with its furniture, for the use of our party, and as it furnished lodgings for several of us, and also enabled me to devote to scientific purposes the rooms in the laboratory which we have used in previous seasons as a kitchen and dining room, I found the necessary space for our party of twelve, although I was compelled to refuse three other applicants for lack of room.

The following is a list of the members of our party.

W. K. BROOKS, Ph. D., *Associate Professor of Morphology, J. H. U.—Director.*
E. A. Andrews, Ph. B., *Fellow, J. H. U.*
A. T. Bruce, A. B., *Fellow by Courtesy, J. H. U.*
G. B. Haldeman, A. B., *Graduate Student, J. H. U.*
J. C. Hemmeter, M. D., *Graduate Student, J. H. U.*
F. H. Herrick, A. B., *Graduate Student, J. H. U.*
W. H. Howell, Ph. D., *Associate, J. H. U.*
O. P. Jenkins, A. B., *Terre Haute, Ind.*
T. W. Mills, M. D., *Lecturer on Physiology, McGill University, Montreal.*
J. P. McMurrich, Ph. D., *Instructor, J. H. U.*
A. D. Morrell, *Chapel Hill, O.*
H. F. Nachtrieb, S. B., *Assistant Professor of Biology, University of Minnesota.*

I have been able this season to make important additions to a monograph on the Medusæ of Beaufort, which has occupied me for the past five years, and which is now complete. Dr. McMurrich began this season the preparation of a similar monograph on the Anthozoa of Beaufort; and Mr. Andrews, who has been occupied for two years in the preparation of a similar history of the Annelids of Beaufort, has made numerous important

additions to his notes, and he has also obtained much valuable material for the study of the embryology of Annelids, upon which he is now at work in Baltimore. Professor Nachtrieb, who has been engaged for several years in a similar monographic study of the Echinoderms of Beaufort, continued this work during the season.

Two monographs on the fauna of Beaufort, one by Professor Conn, on the Crabs of Beaufort, and my own on Beaufort Medusae are now complete and ready for publication.

The members of our party also carried on researches on the embryology of the crustacea, the metamorphosis of macroura, the development of gasteropods, the propagation of the oyster, and many other subjects; and abstracts, giving an outline of the results of researches on the following topics, were published in the University Circular for October, 1885:—

The Metamorphosis of Limulus polyphemus, by Prof. H. L. Osborn, Purdue University, Indiana; Abstract of Researches on the Embryology of Limulus polyphemus, by W. K. Brooks and A. T. Bruce; Observations upon the Chemical Composition and Coagulation of the Blood of Limulus polyphemus, Callinectes hastatus, and Cucumaria, by W. H. Howell; On the presence of Haemoglobin in the Echinoderms, by W. H. Howell; On the Existence of a Post-Oral Band of Cilia in Gasteropod Veligers, by J. Playfair McMurrich; The Rhythm and Innervation of the Heart of the Sea Turtle, by T. Wesley Mills, Lecturer on Physiology, McGill University, Canada; On the Physiology of the Heart of the Alligator, by T. Wesley Mills; The Cardiac Rhythm of Fishes and the Action on the same of certain Drugs and Poisons, by T. Wesley Mills; On the Artificial Propagation and Cultivation of Oysters in Floats, by W. K. Brooks; Notes on the Stomatopoda, by W. K. Brooks; Notes on the Fishes of Beaufort Harbor, N. C., by O. P. Jenkins.

One of the most important and interesting of our studies is the work which has been carried on for several seasons on the natural history of Limulus. In 1884, Mr. Osborn discovered that the eggs of Limulus can be fertilized artificially, and that there is no difficulty in thus obtaining an abundant supply of the early stages. From the eggs which were thus fertilized Mr. Osborn reared a number of larvae, from which he made a series of valuable drawings of the external features. This summer Mr. Bruce and I have continued the study and have obtained a very complete history of the development of Limulus, an abstract of which appeared in the University Circular, No. 43, October, 1885. The most interesting result of this study is the evidence which it furnishes to show that the embryonic history of Limulus exhibits the most striking similarity to that of the ordinary Arachnida. A week after the publication of this abstract our library received the current number of the Quarterly Journal of Microscopical Science, in which there is an illustrated paper on the embryology of Limulus, by Mr. Kingsley, of Salem, Mass., who has reached a similar conclusion. Dr. Howell devoted a part of the season to the study of the blood of Limulus, Mr. Jenkins studied the histology of its digestive tract, and Mr. Wilson its nervous system, and the results of their investigations are either ready for publication or well advanced.

Within the last two months, the second of Mr. Wm. Bateson's papers on Balanoglossus, giving the results of his researches at Beaufort in 1884, has been published in the Quarterly Journal of Microscopical Science, and it is of especial interest, as he gives many very convincing reasons for believing that Balanoglossus, a very lowly organized and simple worm-like organism, is a vertebrate, and by far the most primitive member of this group.

I was occupied for the whole of last winter in preparing from my notes, made at the marine laboratory, an illustrated paper on the origin of alternation of generations in the Hydro-Medusae. This paper, with eight quarto plates, is now in press, and it will soon appear in the Memoirs of the Boston Society of Natural History. Several minor papers on various subjects are also now ready for publication, and some of them are to appear in the next number of the Studies from the Biological Laboratory.

Through the combined efforts of several of the members of our party, a paper giving a list of the animals which occur at Beaufort, with short notes as to their localities, habits, spawning season, development, etc., is now in preparation, and it is to be published this winter in the "Studies."

I was able during the past season to make a few observations upon the Stomatopoda which occur at Beaufort, and they are embodied in my report on the Stomatopoda collected by the Challenger Expedition, which will be ready for the press in a few days. It is to form part of the series of illustrated quarto volumes on the "Scientific Results of the Challenger Expedition," now in course of publication by the British Government.

Respectfully,

W. K. Brooks,
Director, Marine Laboratory.

Baltimore, *November*, 1885.

F.

Proceedings of University Societies.

The several scientific associations, composed of members of the faculty and advanced students, have met for the presentation and discussion of original papers as below stated.

1. The Scientific Association, under the presidency of Professor Martin, has had seven meetings. Papers have been read by: —

W. K. Brooks, on a new theory of variation; methods for producing illustrations for scientific papers.
H. Crew, an account of Juincke's experiments on hydrostatic pressure in a magnetic field.
H. H. Donaldson, the change of color in Anolis; the temperature sense.
J. R. Duggan, the relation of antiseptic power to chemical constitution.
G. S. Hall, on recent experiments on the sense of rhythm; on the question, is scientific psychic research practicable?
C. W. Hayes, on new forms of laboratory apparatus.
J. Jastrow, a comparison of sight and touch.
H. N. Martin, on a certain visual phenomenon not hitherto described.
P. Morrill, on methods of measuring atmospheric electricity.

H. N. Morse, on a simple apparatus that enables students to determine the equivalents of some of the elements.

J. P. McMurrich, the theory of the vertebrate skull.

S. Newcomb, the possibility of applying mathematics to political economy.

C. A. Perkins, on the seat of electromotive force in the voltaic cell.

I. Remsen, on the measure of the attractive force exerted by isomeric and homologous molecules; on the recent discovery of thiophene.

H. A. Rowland, on Sir William Thomson's models to illustrate the theory of light.

G. M. Sternberg, on the question, why does one attack of many infectious diseases protect from a second?

W. E. Story, an account of some geometrical models recently purchased.

G. H. Williams, on the results of the most recent work on the metamorphic and crystalline rocks.

2. The Philological Association, under the presidency of Professor Gildersleeve has had eight meetings. Papers have been read by:—

C. Adler, on the etymology of elixir; note on the catalogue of the books of the Bible in the MS. of the "Teaching of the Twelve Apostles."

W. M. Arnolt, on some oracles in Herodotus.

M. Bloomfield, two etymological notes; the probable Sanskrit equivalent of the Greek particle ἄρ, ῥα; on a new group of Vedic words, belonging to the root *praç*.

J. W. Bright, an account of King Alfred's Anglo-Saxon version of the *de consolatione philosophiae* of Boethius.

A. M. Elliott, on a philological expedition to Canada.

A. Emerson, Petrarca's relations to the universities of his time.

A. L. Frothingham, the meaning of Baalim and Ashtaroth in the Old Testament.

W. E. Gates, some notes on the Elene and Cynewulf.

B. L. Gildersleeve, on Weil's view of the origin of the word "poet;" the final sentence in classic Greek prose.

J. R. Harris, the western readings of the New Testament; the Codex Martinianus of the New Testament.

P. Haupt, on a Eucharistic sermon by John Chrysostom preserved in Ethiopic.

A. H. Huizinga, the lessons of the Peloponnesian War as developed in the speeches of Thucydides.

M. D. Learned, the English element in Pennsylvania German.

C. D. Morris, some account of Beloch's speculation on the financial history of Athens.

E. M. Pease, the relative value of the MSS. of Terence, collated by Umpfenbach.

E. H. Spieker, the dialects of North Germany.

M. Warren, the etymology of hybrid; some old glosses in Codex Sangallensis 912.

H. Wood, the persistence of alliteration in English.

3. The Mathematical Society, under the presidency of Professor Newcomb, has had three meetings. Papers have been read by:—

F. Cajöri, on a quadratic form.

F. Franklin, the discriminant of the equation which determines the axes of a quadric surface.

A. S. Hathaway, the division of irrational algebraic quantity by real primes.

J. F. McCulloch, on the theorem, "every equation has a root."

W. E. Story, on generalized quantity; on the development of rational fraction in partial fractions.

C. Veneziani, on the extension of Rolle's theorem to non-uniform algebraic functions; on the geodesic line.

4. The Historical and Political Science Association, under the direction of Dr. H. B. Adams, has held frequent meetings. Among the papers read were the following:—

H. B. Adams, on the American historical association; the progress of civil service reform in the United States; principles of graduate and undergraduate work in history and politics; the historical tripos at the University of Cambridge.

F. A. Bancroft, on the negro in Mississippi politics.
L. Bonsal, on the question, what became of the northern slaves?
J. R. Brackett, on the slaveholders' convention at Annapolis in 1841; on the free negroes in Maryland.
J. Bryce, on the doctrine of laissez-faire (letter).
D. R. Dewey, on Jevon's investigations in currency and finance; on American literature relating to money, credit, and banking (chapters from a "History of Economic Thought in America").
R. T. Ely, on Pullman, a social study; on contemporary socialism; on the A. R. O. relief association; introduction to the study of administration.
E. A. Freeman, on the study of history at Oxford (letter).
E. R. L. Gould, on the House of Lords; on Canadian studies in local history.
F. H. Hodder, on the city government of Chicago.
W. P. Holcomb, on Pennsylvania boroughs.
E. J. James, on the study of political science in American colleges.
J. F. Jameson, on the study of the constitutional and political history of the individual states; on the state constitutions of the revolutionary period; on the reception of the Massachusetts constitution of 1780 by the towns.
C. H. Levermore, on the history of witchcraft in Connecticut; on the colony at Saybrook, Connecticut; on judicial procedure in the early New Haven courts.
D. R. Randall, on the puritan colony at Annapolis.
J. C. Rose, on the city government of Baltimore.
D. W. Ross, on the methods of studying history in the college and in the university.
S. Sato, on the land laws of the United States.
W. B. Scaife, on boundary disputes between Pennsylvania and Maryland.
E. Schuyler, on the foreign relations of the United States.
A. Scott, on the New Jersey proprietors.
A. Shaw, on the Northwest as a field for original studies.
C. H. Shinn, on the land laws of mining districts.
W. Wilson, on the House of Representatives, revenue and supply (chapter from "Congressional Government"); on recent American economists (chapters from a "History of Economic Thought in America").
T. K. Worthington, on Pennsylvania state finance and taxation; village communities on the Delaware.

5. The Metaphysical Club, under the direction of Professor Hall, has had four meetings. Communications were presented by:—

A. T. Bruce, on final causes.
H. H. Donaldson, on visual localization and the sensation of heat; on the newly discovered organs of the heat sense.
A. H. Gross, on the psychology of reading; on the introspective method.
G. S. Hall, reviews of Meynert's *Psychiatrie*, Radestock's *Genie u. Wahnsinn*, and Sully's *Psychology*; reviews of recent psychophysic studies.
J. Jastrow, on a series of books on ultra-longevity; demonstration of logical machines.
C. H. Levermore, an educational study; the boy in education.
G. S. Morris, on Kapp's *Grundriss einer Philosophie der Technik* and on Du Prel's *Philosophie der Mystik*; on the method of philosophy.
J. C. C. Newton, on a case of contagious frenzy.
W. Noyes, Jr., on local facilities for the study of mental diseases.
C. S. Pierce, on *The Magnet*, a fourteenth century manuscript of Petrus Peregrinus.
G. E. de Steigeur, on a case of visualized number forms.
M. I. Swift, on final causes.

6. The Archæological Society, of which Dr. A. L. Frothingham, Jr. is secretary, has held several meetings. Among the papers presented were the following:—

M. Cohen, on Col. M. I. Cohen, and his collection of Egyptian antiquities, lately acquired by the University.

A. Emerson, on Greek and Etruscan vases.
C. C. Hall, on the Great Seal of Maryland.
A. M. Wilcox on the American school of archæology at Athens.

During the past session, there has been a series of loan exhibitions, under the direction of the Archæological Society, of works of art generously contributed by Mr. A. L. Frothingham, as follows:

November 22, 29, December 6.—Original drawings by old masters of the Italian schools, XVI to XVIII centuries.
December 13, 20.—Photographs of Italian sculpture and painting of the XV century.
January 10, 17.—Photographs of Italian sculpture and painting of the XIV and XVI centuries.
January 24, 31.—Engravings of Italian, French, German and British schools of the XVIII and XIX centuries.
February 7, 14.—Line engravings of portraits of all schools from the XVI to the XIX century (Italian, French, German, Flemish, Dutch and British.)
February 21, 28.—Etchings of Italian schools from the XVI to the XIX century.
March 7, 14.—Etchings of Dutch, German, Flemish and French schools.
March 28, April 4.—Line engravings of Italian schools from the XV to the XVIII century.
April 11, 18, 25.—Line engravings of German, Dutch, Flemish, French and British schools from the XVI to the XVIII century.
May 2, 9, 16.—Original drawings by old masters of the Italian, French and Dutch schools.

The permanent exhibition consisted of fragments of antique sculpture, Etruscan and Italo-Greek vases, and Egyptian statuettes from the Cohen Collection.

7. The Baltimore Naturalists' Field Club, under the presidency of Dr. G. H. Williams, has held seven meetings during the past year. At these meetings, reports were given by various members upon observations made in some of the three departments of the club devoted respectively to Geology and Mineralogy, Zoology, and Botany. Abstracts of these papers and of other more informal communications may be found in the University Circulars, Nos. 35, 38, and 41.

G.

List of Correspondents.

During the past year the Publication Agency of the Johns Hopkins University has received, in exchange with the journals here published, the scientific and literary publications of the institutions named below. A full list of the periodicals on file in the University library (including the journals, etc., received in exchange) is given in University Circular, No. 42, September, 1885.

GERMANY AND AUSTRIA.

Berlin: Deutsche chemische gesellschaft.
K. Preuss. akademie der wissenschaften.
Cassel: Verein für naturkunde.
Cracow: Académie des sciences.
Dresden: Naturwissenschaftliche gesellschaft Isis.
Erlangen: Seminarium philologicum.
Frankfort a. M.: Senckenbergische naturforschende gesellschaft.

Frankfort a. O.: Naturwissenschaftliche verein.
Freiburg i. B.: Naturforschende gesellschaft.
Göttingen: K. gesellschaft der wissenschaften.
Hamburg: Naturhistorisches museum.
Mathematische gesellschaft.
Wissenschaftliche anstalten.
Hannover: Historische verein für niedersachsen.
Heidelberg: Naturhistor-medicinische verein.
University.
Hermannstadt: Verein für naturwissenschaften.
Innsbruck: Institut für Oesterreich. geschichtsforschung.
Kiel: University.
Observatory.
Leipsic: Astronomische gesellschaft.
K. Sächsische gesellschaft der wissenschaften.
Mainz: Mittel-rheinische fabrikanten-verein.
Munich: K. Bayerische akademie der wissenschaften.
Gesellschaft für anthropologie, etc.
Görres-gesellschaft.
Prague: K. Böhmische gesellschaft der wissenschaften.
Verein für geschichte der Deutschen in Böhmen.
Stuttgart: Verein für vaterlandisch-naturkunde.
Trieste: Museo civico di storia naturale.
Vienna: Gesellschaft für bildende künste.
K. k. akademie der wissenschaften.
K. k. geologische reichsanstalt.
K.-k. Oest. museum für kunst und industrie.
Ornithologische verein.
Zool. inst. der universität.
Wiesbaden: Nassauische verein für naturkunde.
Würzburg: Medicinische facultät.
Zool. zootomische institut.

France and Switzerland.

Avranches: Société d'archéologie.
Berne: Schweiz. gesellsch. für d. gesammten wissenschaften.
Caen: Académie des sciences, arts et belles-lettres.
Société des pharmaciens du Calvados.
Cherbourg: Société nationale des sciences nat. et math.
Paris: Institut de France: académie des sciences.
Association française pour l'avancement des sciences.
Assoc. pour l'encouragement des études grecques.
Bureau des longitudes.
École centrale des arts et manufactures.
École des chartes.
École normale supérieure.
École polytechnique.
Faculté des sciences à la Sorbonne.
Ligue française de l'enseignement.
Ministère de l'instruction publique.
Observatoire.
Société chimique.
Société de l'enseignement supérieur.
Société de l'histoire du protestantisme français.
Société de legislation comparée.
Société française d'archéologie.
Société historique et cercle St. Simon.
Société mathématique de France.
Société nationale d'antiquaires de France.

Roscoff: Laboratoire d. zoologie expérimentale.
Toulouse: Académie des sciences.
Zurich: Société helvétique des sciences naturelles.

BELGIUM AND HOLLAND.

Amsterdam: Royal academy of sciences.
Royal zoological society.
Brussels: R. académie des sciences de Belgique.
Musée royal d'histoire naturelle.
Société royale malacologique de Belgique.
Observatoire royale.
Delft: École polytechnique.
Harlem: Musée Teyler.
Société Hollandaise des sciences.
Leyden: Nederland. dierkundige vereln.
Liège: Société royale des sciences.

ITALY.

Bologna: R. deputazione di storia patria.
Società medica-chirurgica.
Brescia: Ateneo di Brescia.
Como: Società storica per la provincia di Como.
Florence: Società entomologica Italiana.
Genoa: Società di letture.
Milan: Istituto Lombardo di scienze e lettere.
R. accademia di belle arti.
Naples: R. academia delle scienze fisiche e. mathematiche.
Società di storia patria.
Zoölogical station.
Padua: Società Veneto-trentina di scienze naturali.
Palermo: Circolo matematico.
Società Siciliana per la storia patria.
Rome: Commissione archeologica comunale.
R. accademia dei Lincei.
R. comitato geologico d'Italia.
Department of foreign affairs.
Società geografica Italiana.
Società Romana di storia patria.
Turin: Observatoire della università.
R. accademia delle scienze.
Venice: R. Istituto Veneto.
R. deputazione Veneto s. g. s. di storia patria.

SPAIN AND PORTUGAL.

Barcelona: Associació d'excursións Catalana.
Lisbon: Academia real das sciencias.
Sociedade da geografia.
Madrid: R. academia de la historia.
Observatorio astronomico.
San Fernando: Instituto y observatorio de marina.

DENMARK, SWEDEN AND NORWAY.

Bergen: Museum.
Christiania: University.
Commission der gradmessung.
Société des sciences.
Copenhagen: Royal academy of sciences.

Stockholm: Hogskola.
Geologiska forening.
Physiologische laboratorium.
K. Svenska vetenskaps akademie.
K. historische antiquitets akademie.

Russia and Finland.

Charkow: Mathematical society.
Dorpat: Naturforscher gesellschaft.
Helsingfors: Societa scientiarum fennica.
Moscow: Société impériale des naturalistes.
St. Petersburg: Académie impériale des sciences.
Russian archæological society.
Russian chemical society.

Great Britain and Ireland.

Birmingham: Philosophical society.
Cambridge: Antiquarian society.
Philological society.
Philosophical society.
Dublin: Royal Dublin society.
Royal Irish academy.
University press.
Edinburgh: Royal physical society.
Royal society.
Glasgow: Philosophical society.
Observatory of the university.
Greenwich: Royal observatory.
London: Chemical society.
Conchological society.
Crystallogical society.
Geological society.
Institute of actuaries.
Mathematical society.
Mineralogical society of Great Britain and Ireland.
Palestine exploration fund.
Philological society.
Royal astronomical society.
Royal institution.
Royal microscopical society.
Royal society.
Science and art department (South Kensington).
Society of biblical archæology.
Society of chemical industry.
Society of telegraph engineers.
Statistical society.
Manchester: Literary and philosophical society.
Oxford: Historical society.

British East Indian Possessions.

Calcutta: Asiatic society of Bengal.
Colombo, Ceylon: Ceylon branch of royal Asiatic society.
Singapore: Strait's branch of the royal Asiatic society.

Africa.

Bone, Algeria: Académie d'Hippone.
Oran, Algeria: Société de géographie et d'archéologie.

JAPAN.

Tokio: Seismological society of Japan.
University: science department.
Yokohama: Asiatic society of Japan.

AUSTRALIA AND NEW ZEALAND.

Adelaide: Royal society of South Australia.
Sydney: Linnean society.
Royal society of New South Wales.
Wellington: New Zealand institute.
Colonial museum.
Geological survey.

MEXICO AND SOUTH AMERICA.

Cordoba (Arg. Rep.): Academia nacional de ciencias.
Mexico: Observatorio del Mexico.
Quito: Universidad de Quito.
Rio de Janeiro: Observatoire impériale.

DOMINION OF CANADA.

Halifax: Institute of natural science.
Montreal: Royal society of Canada.
Natural history society.
Ottawa: Geological and natural history survey.
Toronto: Canadian institute.

GREECE AND TURKEY.

Athens: Deutsch. archäolog. Institut.
Constantinople: Hellenikos philologikos syllogos.

UNITED STATES.

American association for the advancement of science.
American historical association.
American institute of mining engineers.
American medical association.
American oriental society.
American philological association.
American social science association.
Association of engineering societies.
Albany: N. Y. state museum of natural history.
Annapolis: U. S. naval institute.
Baltimore: Maryland historical society.
Medical and chirurgical faculty of Md.
Peabody Institute.
Boston: American academy of arts and sciences.
Mass. historical society.
National association of wool manufacturers.
New England historic-genealogical society.
Public library.
Society of natural history.
Webster historical society.
Zoölogical society.
Cambridge, (Mass.): Harvard college observatory.
Harvard college library.
Museum of comparative zoölogy.
Chicago: Academy of sciences.

Cincinnati: Mechanics' institute.
Observatory.
Public library.
Society of natural history.
Concord: New Hampshire historical society.
Davenport (Iowa): Academy of natural sciences.
Denver: Colorado museum of geology, etc.
Scientific society.
Normal (Ill.): Illinois state laboratory of natural history.
Iowa City: Iowa state historical society.
Ithaca (N. Y.): Cornell university library.
Lincoln (Neb.): Nebraska historical society.
Lowell (Mass): Historical association.
Madison (Wis.): Washburn observatory.
Wisconsin historical society.
Minneapolis: Minnesota academy of natural sciences.
Minnesota natural history and geological survey.
New Haven: Connecticut academy of arts and sciences.
Newark: New Jersey historical society.
Newport (R. I.): Natural history society.
New York: Academy of sciences.
American chemical society.
American geographical society.
American institute of mining engineers.
American museum of natural history.
Columbia college, school of mines.
Linnaean society.
Microscopical society.
Military service institution.
Philadelphia: Academy of natural sciences.
American philosophical society.
College of physicians.
Franklin institute.
Library company.
Mercantile library.
Penna. historical society.
University of Pa., Wharton school.
Portland: Maine historical society.
Princeton (N. J.): Museum of geology and archæology.
Providence: Rhode Island historical society.
Public library.
Raleigh: North Carolina agricultural experiment station.
Richmond: Southern historical society.
Virginia historical society.
Salem (Mass.): Essex Institute.
Peabody academy of sciences.
San Francisco: California academy of sciences.
Technical society of the Pacific Coast.
Savannah: Georgia historical society.
Sedalia (Mo.): Natural history society.
St. Louis: Academy of sciences.
St. Paul: Minnesota historical society.
Topeka: Kansas state historical society.
Washburn college laboratory.
Troy (N. Y.): Rensselaer society of engineers.
Washington: Army medical museum.
Astronomical observatory.
Biological society.

Washington: Bureau of ethnology.
Coast and geodetic survey.
Corps of engineers.
Fish commission.
Geological survey.
Naval museum of hygiene.
National academy of sciences.
National museum.
Naval medical society.
Patent office.
Philosophical society.
Signal service.
Smithsonian institution.
Other government publications.
Worcester: American antiquarian society.

H.

Gifts to the Library from September 1, 1884, to September 1, 1885.

ABBOT, PREST. T. C. Michigan Agricultural Report. Lansing, 1884. O.
ADAMS, F. G. Kansas Historical Documents, 1862-82.
ALDEN, REV. E. K. The Missionary Herald. Boston, 1821-84. 64 vols. O.
ALDEN, E. & BRO. American Newspaper Catalogue for 1884. Q.
AZARIAS, BROTHER. Culture of the Spiritual Sense. New York, 1884. O.
BABCOCK, HON. J. Nevada Public Documents. Carson City, 1883. O.
BACON, R. A. Railroad Commissioners' Reports, Georgia. Atlanta, 1881-83. 3 vols. O.
BALL, R. S. (Author). Astronomical Researches, v. Dublin, 1884. Q.
BANCROFT, F. A. Bernheim, A. C. History of the Law of Aliens from the Standpoint of Comparative Jurisprudence. New York, 1885. O.
BANCROFT, T. B. Report of Inspector of Mines, Ohio. Columbus, 1884. O.
BELL, A. G. (Author). On the Formation of a Deaf Variety of the Human Race. Washington, 1884. Q.
BELL, A. M. The Emphasized Liturgy. London, 1866. O.
BERRY, HON. J. H. Arkansas Public Documents. Little Rock, 1885. O.
BILLINGS, J. S., M. D. Index Catalogue of Library of Surgeon General's Office. v. VI. Washington, 1884-85. Q.
BINION, S. A. Tacitus: Italian translation of Davanzati. 3 vols. Bassano, 1803. Q.
BISHOP, HON. J. Statistics of Labor and Industries, N. J. Trenton, 1878-82. 5 vols. O.
BOURINOT, J. G. (Author). Parliamentary Procedure. Montreal, 1884. O.
BRADEN, HON. W. W. Report of State Auditor, Minnesota. St. Paul, 1879-83. 4 vols. O.
BRITISH MUSEUM. Collectio Davidis. Hamburg, 1826. D.
BROWNING, O. Political Memoranda of Francis, fifth Duke of Leeds. London, 1884. O.
Treaty of Commerce between England and France in 1786. London, 1884. O.
BRÜNNOW, R. E. (Author). Die Charidschiten u. d. ersten Ommayyaden. Leiden, 1884. O.
BUCKNELL, MRS. EMMA W. Documents of the American McAll Association. Philadelphia, 1884-85.
BUSH, G. G. (Author). Origin of the first German Universities. Boston, 1884. O.
BUZBY, G. L. Reports of Board of Trade, Philadelphia. 1879-85. 7 vols. O.
CHAMBERLAIN, D. H. (Author). Not a "College Fetich." Boston, 1884. O.
CHISOLM, J. J., M. D. Dictionnaire de Médecine. 15 vols. Paris, 1829. O.
Pelouze et Frémy. Traité de Chimie. 4 vols. and atlas. Paris, 1854. O.

CLAPP, REV. A. H. The American Missionary. New York, 1870–85. 15 vols. O.
CLARKE, PROF. J. C. C. (Author). The Semitic Alphabet. Chicago, 1884. O.
COLLIN, J. (Author). Marine Fauna of Denmark. Kjöbenhavn, 1884. O.
CRAFTS, W. A. Railroad Commissioners' Report. Boston, 1885. O.
CROCKETT, HON. L. L. State Treasurer's Report, Nevada. Carson City, 1882. O.
DECHERT, R. T. City Controller's Report, Philadelphia, 1884. Philadelphia, 1885. O.
DORN, HON. H. Report of Inspector of Shops and Factories, Ohio. Columbus, 1885. O.
DORNER, HON. J. M. State Documents, Nevada. Carson City, 1884–85. O.
DRUM, GEN. R. C. Official Army Register of the Volunteer Force of the U. S. Army for 1861–65. Washington, 1865. 8 vols. O.
DRURY, HON. W. Nevada Public Documents. Carson City, 1883–85.
DURRETT, R. T. (Author). John Filson, His Life and Writings. Louisville, 1884. F.
DWIGHT, H. E. (Editor). Life and Writings of V. K. Bradford. Philadelphia, 1885. O.
ENOS, J. S. Report of Bureau of Labor and Statistics, California. Sacramento, 1884. O.
ERDSMANNSDÖRFFER, B. A. d. Zelten des deutsch. Fürstenbundes. Heidelberg, 1885. O.
FELL, HON. L. T. Report on Factories and Workshops, New Jersey. Trenton, 1884. O.
FOSTER, W. E. Collections of R. I. Historical Society. Vol. 7. Providence, 1885. O.
FOWLER, HON. F. A. Report of Bureau of Statistics, Wisconsin. Madison, 1884. O.
GADDESS, C. W. Rapin's History of England. London, 1784–89. 3 vols. F.
GATES, W. E. (Author). The Elene and Cynewulf. MS. vol. 1885. O.
GEORGIA HISTORICAL SOCIETY. Collections. Savannah, 1842–75. 3 vols. O.
Stevens, W. B. History of Georgia. New York, 1847. 2 vols. O.
GIBSON BROS. Procès-verb d. l. Conf. Internationale p. l'adoption d'un premier meridien. Washington, 1884. O.
GILMAN, PREST. D. C. Hamilton A. Oeuvres. Paris, 1805. 3 vols. O.
Hoffmann, W. Beschreibung der Erde. Stuttgart, 1832–42. 5 vols. O.
The Nation. New York, 1869–76. 8 vols. Q.
Pecchio, G. Storia della Economica Publica in Italia. Lugano, 1829. O.
Webster, P. Political Essays. Philadelphia, 1791. O.
and forty other bound volumes and a large number of pamphlets.
GLEN, F. W. [Through Mr. E. R. L. Gould.] Ontario Public Documents. Toronto, 1873-82.
Canada Public Documents. Ottawa, 1881–84.
GREEN, HON. S. A. Manual for the General Court of Massachusetts. Boston, 1885. D.
Publications of the Massachusetts Medical Society.
GRISWOLD, S. B. New York Public Documents. Albany, 1883–84. 18 vols. O.
GUTHRIE, M. (Author). On Spencer's Data of Ethics. London, 1884. O.
HALL, I. H. Facsimile of part of a Syriac Version of the Gospels. Philadelphia. Q.
HARRIS, J. RENDEL. Catalogue of Hebrew MSS. of Bibliothèque nationale, Paris. Q.
Catalogue of Syriac MSS. of the Bibliothèque nationale, Paris. Q.
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Lenormant, F. L'Alphabet Phénicien. Paris, 1866. Q.
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Issued, November 30, 1885.

ELEVENTH

ANNUAL REPORT

OF THE PRESIDENT OF THE

Johns Hopkins University

Baltimore, Maryland

WITH A REVIEW OF THE TEN YEARS FROM 1876 TO 1886

1886

BALTIMORE
PUBLICATION AGENCY OF THE JOHNS HOPKINS UNIVERSITY
1886

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REPORT.

To the Trustees of the Johns Hopkins University:—

Gentlemen:

In presenting to you the eleventh annual report of the Johns Hopkins University, I beg leave to recur to the principles upon which its work began ten years ago, in the autumn of 1876, and to make some collective statements which will enable you to judge of the tendency of this organization. With most of the facts which I shall state you are already familiar; for our numerous reports, registers, and circulars have placed on record,—with a minuteness of detail which is unusual, though not without precedent,—an abundance of current information. I am not without the hope that you and the staff of instructors, as well as our students and their parents, and all other persons who are interested in the efforts which are making to build up a university upon the foundation which was laid by Johns Hopkins, will be glad to review the work of the first decade. One of your own number, who is intimately acquainted with the interior life of the University, was requested on our tenth anniversary to make a public address in which he gave many historical statements, and discussed the purposes and aims of this foundation. I must of course repeat some facts which he then stated in a concise and pointed manner;

but as the printed page is not governed by the restrictions of a platform address, I shall feel at liberty to amplify details to which he only made allusion.*

It would be a great omission, if I were not to begin with a fresh recognition of the bounty of Johns Hopkins "who by noble gifts for the advancement of learning and the relief of suffering has won the gratitude of his city and his country." His generous deed has caused his name to be honorably known in every part of the world where learning is promoted. One of the best evidences of this fact is the increasing series of scientific transactions which are addressed to the Johns Hopkins University from the centres of scientific and literary activity.

The largeness of his purpose was equal to the largeness of his gifts. He devoted his fortune to a University and a Hospital,—intending that so far as medical education was concerned the two institutions should be the closest allies; but he did not prescribe the conditions under which these two ideas should be developed. He knew that the promotion of

* Our decennial celebration would properly have been observed on the twenty-second of February, 1886,—but on account of the death of Professor Morris, it was postponed until April 26, 1886. At that time the Trustees, the Faculty, the students, and the representatives of other institutions of learning in this vicinity assembled at the University and went in procession to the Mt. Vernon Methodist Episcopal Church. After prayer by Rev. Dr. Longacre, pastor of the church, addresses were made by Professor Gildersleeve representing the literary work of the University, Professor Rowland its scientific work, and Professor Welch its relations to medical science; and the final address was given by Dr. James Carey Thomas, on behalf of the Trustees. An ode to the university, by one of the graduate students, Mr. R. E. Burton, was also read. After these exercises the graduates of the University, of whom one hundred may have been present, partook of a collation, and listened to extempore speeches. In the evening all the buildings were thrown open and a reception was given to the students and their friends. The addresses were printed in the Johns Hopkins University Circulars, No. 50, June, 1886.

knowledge and of charity would call for very large outlays in all future generations, but in planning for the remote as well as for the present, he was sagacious enough to perceive that methods must change with changing circumstances, and he left to the trustees,—whom he selected with great care,—all the freedom which was requisite for the administration of their work consistently with an adherence to the noble purposes which he had in mind. He provided with equal liberality for the promotion of an educational foundation of the highest name, and for a medical foundation where the utmost skill should be employed in the alleviation of bodily infirmities. The mode in which these establishments should be organized he left to the wisdom of others. To promote these philanthropic objects, he constituted two corporations, taking care that nine of the twelve incorporators in each board should be members of the other board; and he placed no obstacles in the way of making the boards identical in their membership if such an arrangement should prove desirable in the future,—as is almost certain to be the case.

The question of determining what sort of a university should be established was left to the original trustees. They sought the best counsel that the country afforded and they inquired into the management of European institutions. When I had the honor of being called into their service, now nearly twelve years ago, I was impressed by the liberality and the unanimity of their views. With one voice, they were determined to promote an establishment of as high a grade as possible with the resources at their command, in the present condition of this country. While they were desirous of perpetuating all that is valuable in the experience and usages of older foundations, they were prepared to act in the freedom of

a new and untrammelled endowment. They were already clear in the view that they were not asked to establish in Baltimore a simple college, but something higher,—a university. It was not to be a local high-school, nor a school of technology, nor a group of professional schools. It was to supplement and not supplant existing institutions. Often, in private conversations and in official interviews, I was charged to hold up the highest standard, to think of nothing but the best which was possible under the limitations of a new establishment, in a country where the idea of the university had not been generally understood. The belief was prevalent that able young men, after preliminary courses in other colleges, would come to Baltimore for the purpose of carrying forward their education in the different branches of literature and science. The hope was entertained that such students would come to us especially from Maryland and from States south and southwest of it which were then recovering from the disasters of the civil war. At the same time the immediate requirements of the great city of Baltimore were never forgotten, and arrangements were made for the reception of young men of collegiate age who would otherwise have been obliged to seek, at a distance, that instruction which ordinarily leads to a baccalaureate degree.

The result of these first deliberations was the establishment in 1876 of a Philosophical Faculty, (or a Faculty of the Liberal Arts, as some would prefer to call it, or a Faculty of Letters and Science, as others would say,) which included a college for undergraduates and many departments of instruction for more advanced students. Laboratories were provided in physics, chemistry, and biology, and courses of study were arranged in the higher mathematics, in ancient and modern languages and literatures, in history and philosophy. The

addition of other faculties was considered, but no definite action was taken.

The first difficulty to be overcome was the selection of a staff of teachers. Innumerable applications for appointment were received from persons of different degrees of merit, and overtures were made in the name of the Trustees to many persons of distinction. But it soon became apparent that it would not often be possible to transfer men in middle life and of acknowledged reputation from the institutions with which they were connected, in this land or in Europe, to the new and undeveloped foundation in Baltimore, which might indeed be full of promise, but which could not offer the accumulated possessions, resources, and reputation of older foundations, nor appeal to an established policy as a surety for the future. A few distinguished men were found who were willing to be identified at the beginning with the new institution,—among them a leader in science, a leader in letters, and a leader in collegiate work,—but the staff was principally made up of younger men. Time has shown that the selections were wisely made, and no one now regrets the youth and vigor of the faculty.

The place where instruction should be given was also a matter of the earliest consideration. The founder had given to the University his country seat which was known as Clifton, in Baltimore county, and he had used expressions which implied his expectation that the University would there be established. But he had not bound his trustees to carry out that idea. They soon discovered how difficult it would be to begin the University so far from town; and at an early day they decided unanimously to purchase accommodations in the heart of Baltimore and to open the rooms thus acquired for instruction. The legislature of the State confirmed this

decision by a formal enactment. Unexpectedly to every one, the site thus chosen at the corner of Howard and Ross streets proved to be so convenient that it has continued to be occupied by the University. Additional purchases of real estate have been made in the neighborhood and new buildings have been constructed. Meanwhile, the city has taken possession of a considerable portion of the Clifton estate for a reservoir, the construction of which is still in progress, and the effect of this unexpected encroachment cannot yet be determined.

As the necessities of the University have required additional rooms, five buildings have been constructed on sites adjacent to the original purchase. The first of these was an annex which included a public hall and a library room, both completely outgrown; there are three large and admirable laboratories, for Chemistry, Biology, and Physics (the latter not yet quite completed); and the fifth new building is a gymnasium. In addition to all these structures, several dwelling houses in the neighborhood have been purchased and are now in use for recitation-rooms and studies. But these acquisitions are inadequate to our growth. The University requires a central academic building designed for the various literary lecture-rooms and class-rooms. It needs a suitable hall for the assembly of an audience of five hundred persons or more; and its rapidly increasing library calls for much more space. A chapel, or a building for the Christian Association of the University, would also be most welcome. Suitable places for the arrangement of such collections as may be acquired are likewise needed. Every piece of property thus far devoted to the educational work of the University has been paid for from the income of the original fund. The time is near, as it seems to me, when the University may hope to receive from generous benefactors

the new buildings which it requires. Other colleges, in every part of the land, have thus been benefited, and the beautiful libraries, lecture-rooms, museums, and chapels, which within the last five and twenty years have been built by private munificence, are the enduring monuments of those whose names they bear, and are fruitful agencies in the advancement of knowledge and the education of young men.

Baltimore is destined to be a university city. The Johns Hopkins foundation now attracts from distant places students, visitors, and residents. It will, as years go on, be more and more serviceable to the community in which it is placed. With increasing facilities, it will reach out in many ways for the intellectual benefit of all the citizens. It already exerts an obvious influence upon the schools for boys and girls. The advantages of its library and reading-room are recognized by professional men; its public lectures are attended by audiences much too numerous for the rooms to which they are invited; its collections should be enlarged and displayed where the public may see them. But if the buildings are paid for from the income of the foundation, other pressing needs will be neglected. The University must therefore appeal to enlightened and liberal citizens to build upon the foundation which has here been firmly laid. A decade is a brief period in the history of education, but it is long enough to show what is likely to be developed in Baltimore.

The students who have here been taught are naturally grouped in two classes,—those of the collegiate standing, most of whom are looking forward to the degree of Bachelor of Arts; and those of an advanced standing who are following the freer courses of university instruction, sometimes with reference to the degree of Doctor of Philosophy, and sometimes with the simple wish to add one or two or more years

to their academic training. In distant parts of the country, the advanced work of our students attracts the most attention; at home, the collegiate work finds its chief recognition.

At the risk of repeating some of the phrases which have often been employed in our public announcements, I beg leave to add a few words upon the distinction which has here been made, in accordance with the best traditions and usages of other institutions, between collegiate and university instruction. In the confused nomenclature of American education, each institution needs to explain its own vocabulary so that the youth of the country and their guardians, in selecting places of study and schedules of instruction, may know exactly what they may expect.

Holding to the fundamental notion, that collegiate instruction is essentially the training of the mind and character to habits of fidelity, attention, perseverance, memory, and judgment, we have encouraged young men to come to us between the ages of sixteen and twenty, and submit themselves to the discipline of appointed courses of study. We have not required these courses to be identical, but in recognition of the wants of most of those who have come to us, we have marked out several parallel plans of study,—which have come to be called "Groups,"—and have offered them to the choice of matriculated students. Each of these courses has been so arranged as to make it certain that the student who completes it will have a good mathematical discipline, a knowledge of Latin, French, and German, at least one year of instruction in science, besides an introduction to logic, ethics, and psychology and to history, physical geography, and English. In addition, during two years of his college course he must give steady attention to two dominant subjects such as the classics, mathematics, physical, chemical or biological science, his-

tory and politics, or the modern languages. In this way we have endeavored to secure a positive amount of regulation with a certain amount of freedom; we have endeavored to provide a liberal education which should have a tendency toward some future occupation. At the same time we have not compelled a student to follow any one of these courses when he could show good reasons for deviation, and could arrange an equivalent and satisfactory combination among the various subjects presented to him. For an account of this plan of undergraduate study, an article in the Andover Review for June, 1886,—afterwards reprinted in Baltimore,—may be consulted.

The university work is based upon the notion that the students who enter upon it have already pursued such disciplinary courses as fit them for the freer methods of study encouraged in lecture-rooms and seminaries, in laboratories and libraries, under the guidance of the various professors. Those who look forward to a second degree are required to devote at least three years, after taking the baccalaureate degree, to university studies, and to offer in their final examinations one subject of a broad and comprehensive character, as their principal study, and two others as subordinate. Some of the combinations which have been offered are these:

Physics, with Mathematics and Chemistry;
Greek, with Sanskrit and Latin;
Ethics and History of Philosophy, with Psychology and Political Economy;
Chemistry, with Mineralogy and Petrography;
Mathematics, with Astronomy and Psychology;
English, with German and Pedagogics;
Geology, with Mineralogy and Chemistry;
History, with Political Economy and International Law;
Assyriology, with South Shemitic Languages and Philosophy.

But the university students are by no means compelled to prepare for the degree of Doctor of Philosophy. Many persons come here without reference to a degree, for the purpose

of spending one or more years in the continuance of a liberal education,—supplementing their collegiate courses by attention to subjects which they have hitherto passed by; many who expect to follow the profession of law pursue the instruction given in history and politics; medical students seek the facilities of the laboratories devoted to physiology and pathology; not a few clergymen have followed courses in the Shemitic tongues and in ethics, and some have taken up natural science.

These opportunities for study have been appreciated by an increasing number of students, who have been quite evenly distributed, by the principle of natural selection, in the several departments. A large number of college instructors have come here for one or more years in order to be better fitted for their work, and a still larger number after pursuing prolonged courses of study among us have been called to professorships and other honorable stations.

The methods employed in university study vary with the subjects and the teacher. It is interesting to observe that courses of lectures are less frequent and less extended than in former times. In place of formal discourses, carefully written out and repeated year after year, a great deal of investigation and study is carried on by students in the presence of teachers and under their guidance and inspiration. Of course this is chiefly the case in scientific branches where the use of instruments and of other facilities provided by the University requires the constant presence of the student in the appointed laboratory. But kindred methods are followed to some extent in literary studies. Special libraries have been provided in history, in classics, in the Shemitic tongues, and in other branches; and seminaries, where the professor, by personal example and inspiration, guides the reading and study of a select class, seated around a reading-table, are becoming a significant feature in our work. The seminary

work is supplemented by lectures and examinations, on the one hand; and on the other, by the meetings of associations devoted to science, to philology, to history, etc., in which many persons, both teachers and students, are brought together, sometimes for informal conference, oftener for the purpose of listening to carefully prepared papers.

In connection with our tenth anniversary an effort was made to trace the history of those who have been here as students since the beginning of instruction, including both collegiate and advanced students. At that time one hundred and seventy-six of our former pupils were known to have been engaged in the work of teaching,—and by far the larger part of these were employed in colleges and other superior institutions. Three of them are now at Harvard; two are in the University of California; and many are to be found in the Southern and Western States. Among the former pupils are eighty physicians; thirty-eight ministers; and thirty-four lawyers. Others have entered upon scientific pursuits, or are engaged in business.

The geographical origin of our students is not without interest. Nearly one-half of them came from Maryland (419); and the remainder from thirty-five different States, and from several foreign countries. Sixteen Canadians have been here and five Japanese. Next to the number of students from Maryland is that from New York (69), and then stand next in order the companies from Massachusetts (47), Pennsylvania (38), Ohio (31), Virginia (26), North Carolina (24), New Jersey (19), Kentucky (18), Iowa (15), and the District of Columbia (15). The number of students from the Southern States is increasing as the opportunities here afforded become better known. Very few Baltimoreans now go away from home to obtain a collegiate education.

But two degrees have hitherto been offered,—that of Bach-

elor of Arts and that of Doctor of Philosophy. At the close of the tenth academic year the former had been bestowed upon one hundred and nineteen young men; the latter on eighty-four more advanced students,—in all cases after prolonged courses of study and systematic examinations.

The enrolment during the first decade is shown by the following summaries:

TEACHERS (INCLUDING NON-RESIDENT LECTURERS.)

A distinction is made between lecturers who conducted regular classes and those, here called "non-resident," who simply gave public lectures in Hopkins Hall during brief periods.

Year.	Total.	President and Professors.	Associate Professors.	Associates.	Instructors and Assistants.	Lecturers.	Non-resident Lecturers.
1876–77	29	7	—	12	—	1	9
1877–78	33	7	—	12	—	1	13
1878–79	25	7	—	12	—	1	5
1879–80	33	7	—	14	6	5	1
1880–81	39	7	—	16	9	4	3
1881–82	43	7	—	16	9	4	7
1882–83	41	7	—	16	9	5	4
1883–84	48	8	8	8	11	5	8
1884–85	51	10	9	11	12	2	7
1885–86	48	10	11	11	11	1	4
1886–87	—	10	12	13	10	—	—

STUDENTS.

Years.	Teachers, omitting "non-resident" Lecturers.	Total Enrolled Students.	Graduate Students, including Fellows.	Undergraduates.		Degrees Conferred.	
				Matriculates, including Candidates.	Special, including Prel. Med.	A. B.	Ph. D.
1876–77	20	89	54	12	23	—	—
1877–78	20	104	58	24	22	—	4
1878–79	20	123	63	25	35	3	6
1879–80	32	159	79	32	48	16	5
1880–81	36	176	102	37	37	12	9
1881–82	36	175	99	45	31	15	9
1882–83	37	204	125	49	30	10	6
1883–84	40	249	159	53	37	23	15
1884–85	44	290	174	69	47	9	13
1885–86	44	314	184	96	34	31	17
1886–87*	45	355	205	109	41	—	—

*In December, 1886.

Nine hundred and twenty-four individuals have been enrolled as students, of whom four hundred and nineteen have come from Maryland, (including three hundred and thirty from Baltimore), and five hundred and five from forty-eight other States and countries. Five hundred and ninety-four persons pursued courses as graduate students, and three hundred and ninety-one as collegiate students.

Much of the success of the institution is due to the system of fellowships. Every year twenty young men who have given evidence of their attainments and of intellectual promise are selected by the authorities as Fellows and are encouraged to devote all their time to the study of some branch of knowledge in which they have already shown proficiency. During the first ten years, this honor has been bestowed upon one hundred and thirty-four individuals. Their names and the stations to which they have been called after holding the fellowship have been frequently printed, and a scrutiny of the list will show that it contains the names of many excellent scholars. The subjects to which they have been devoted are these:

Biology,	21	Shemitic Languages,	3
Chemistry,	21	English,	3
Mathematics,	18	Latin,	2
Greek,	18	Sanskrit,	2
Physics,	14	Romance Languages,	2
Philosophy,	13	Mineralogy and Geology,	2
History and Political Science,	9	Engineering,	2
Teutonic Languages,	4		

While resident among us, as Fellows, or as Fellows by courtesy, (an honorary distinction without emolument), these honormen have been regarded as leaders among the students. They have been recognized as holding an intermediate position between the Faculty and the great body of pupils; they have been efficient members of the various literary and scientific associations; they have occasionally given lectures on special

topics to which they were devoted. The principal features in the method of appointment here adopted have been followed in other institutions both in this country and in Great Britain.

The founder of the University in his will made use of this language: "I further request the Trustees of the said University to establish, from time to time, such number of free scholarships in the said University as may be judicious, and to distribute the said scholarships amongst such candidates from the States of Maryland, Virginia, and North Carolina, as may be most deserving of choice, because of their character and intellectual promise; and to educate the young men so chosen free of charge." The best method of carrying out his wishes has been a matter upon which some difference of opinion has prevailed, and different modes of appointment have from time to time been adopted by the trustees. Our records show that two hundred and thirty-five students from the three States named have received free tuition during a part or the whole of their course of study among us. One hundred and fifty of these were appointed "Hopkins Scholars." As experience was gained in the bestowal of these scholarships, it was generally admitted that they ought to be awarded not as a charity to the needy, but as an honor to the meritorious. Accordingly, during recent years, examinations have been held, and the scholarships have been given to those among the applicants who showed the highest attainments. All the Hopkins scholarships carry free tuition, and some of them, designated as "Honorary," have an additional stipend.

There is a third class of scholarships, ten of which are open to the Bachelors of Arts of this University, and ten to graduates of this or of other institutions, who may be engaged in the prosecution of their work among us. These appointments are likewise bestowed as honors.

No other prizes have been offered, and no formal announcements have been made of the comparative standing of the students. Records are kept by the several instructors and are reported at appointed times to the collective authorities. The results of his examinations are known to every student, and are annually communicated to the parents. But these checks are chiefly valuable as a warning to those who are in some way negligent and deficient. The students generally, undergraduates as well as graduates, do not require the stimulus of comparative marks and competitive examinations. They are encouraged to study for the sake of the knowledge and power which they will acquire, and not for the sake of surpassing their comrades.

There has been a remarkable freedom from boyish manifestations of a mischievous spirit. The accessibility of the teachers, and their abstinence from annoying and petty supervision, have doubtless contributed to a good understanding with their pupils. Other reasons for the prevalence of good order might be suggested, but whatever the cause, it is a pleasure to record the fact that during the first ten years of our academic history there has never been a breach of decorum requiring the action of the faculty.

Liberal allowances have been made for the purchase of scientific apparatus, and for the manufacture in the University work-shop of such pieces as might be devised and required by those who are engaged in scientific research. The amount charged to this account on the Treasurer's books during the last ten years is $75,122, and this does not include such fixtures as could be considered a part of the construction expenses. The equipment of the chemical and biological laboratories is quite complete. In physics, the University has such instruments as are required in the demonstration of the usual courses

of lectures, and a good variety of such instruments of precision as are needed by students who are learning the habits of accurate observation; and there are also many costly pieces adapted to investigation, especially in light, heat, electricity and magnetism. The mineralogical laboratory has recently received its equipment (including goniometers, microscopes, lathe, etc.), and for the pathological laboratory, important purchases (including microscopes, kymograph, etc.) have been made. Negotiations are in progress to secure a telescope and such other instruments as will be required in teaching practical astronomy.

The mineral cabinet comprises the Allen collection of about 1,800 specimens, formed by Prof. O. D. Allen, of the Sheffield Scientific school, New Haven, and purchased from him; the Root collection of about 1,200 specimens, purchased of Prof. Oren Root, of Hamilton College, Clinton, N. Y.; and about 2,000 other specimens acquired at different times by gift or purchase. For a valuable suite of ores from the Pacific Coast the University is indebted to the liberality of Mr. George T. Marye, of San Francisco. The material in the petrographical cabinet is valuable and interesting, consisting of the Stürtz collection of European rocks; the Hitchcock collection of New Hampshire rocks; a large suite from the Archaean regions of Lake Superior, deposited by the U. S. Geological Survey, and another from the Lake of the Woods, recently presented by Mr. A. C. Lawson, fellow of the University. There are further accessible for study, Dr. Williams' private collection of European and American rocks, the Lehmann collection of Saxon rocks, and many smaller suites from various localities. Large and complete collections of the rocks of Baltimore County have been made under the auspices of the Field Club, and are preserved in the petrographical laboratory. Of

nearly all this material microscopic sections are at hand for study, and also apparatus necessary for preparing new sections. In natural history, the plan has been to exhibit first a series of typical skeletons illustrative of the principal orders in zoology; and secondly, examples of the fauna and flora of the Baltimore region. By the liberality of some of the members of the family of the late Mr. M. I. Cohen, of Baltimore, the University has acquired at a moderate cost his private cabinet of Egyptian antiquities, formed under favorable circumstances many years ago.* Other historical relics have been presented by individuals, and a very interesting collection of autographs and literary mementos has been commenced by Dr. Adams. A bureau of maps and charts has been begun. The mathematical rooms are furnished with a number of models, manufactured by J. Schröder, of Darmstadt, illustrative of surfaces and curves.† For the study of classical antiquity, the University has acquired but little apparatus. In the Peabody Institute, however, our students have access to a choice collection of casts from the antique presented by Mr. John W. Garrett, and selected by Mr. W. T. Walters. To the latter gentleman we are indebted in common with other residents of Baltimore for frequent opportunities to visit his gallery of oriental art,—including porcelain, bronzes, lacquer, etc., from Japan and China,—and his gallery of modern paintings. The proximity of Baltimore to Washington makes it easy for the specialist to visit the great collections of the capital. Those of the National Museum, of the Smithsonian Institution, and of the Army Medical and Surgical Museum have been most serviceable to our workers.

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*See the Johns Hopkins University Circulars, No. 35, December, 1884, for a letter of Mendez Cohen, Esq., describing this collection.

†Lists are printed in the Johns Hopkins University Circulars, No. 25, August, 1883, and No. 36, January, 1885.

The character of the library has been largely influenced by the fact that within a very short distance from our doors stands the Peabody Institute. Within its walls are more than eighty-six thousand volumes, selected during the last few years for the needs of scholars. This library is particularly well supplied with the transactions of learned societies, long series of historical documents, and costly works in archæology and natural history. The volumes are well bound, well arranged, and well indexed. The catalogue is passing through the press, in several large octavo volumes, the third being nearly completed. With such a foundation in our immediate neighborhood, it has not been necessary for us to attempt to build up a great library. We have rather aimed to purchase such books as the Peabody did not own, such as were immediately required by the leading teachers among us, and such common books as might be needed for every day use. We have taken pains to secure the sight of all new publications of a scholarly character which are printed in German, French, and English. We receive, by subscription and exchange, the principal scientific periodicals of the world, to the number of eight hundred and thirty-two; and this list is supplemented by those received by the Peabody Institute and other Baltimore libraries.*

The number of volumes in the Hopkins library is now 30,000 (besides many unbound pamphlets), the cost of which has been $63,635. According to subjects, they are arranged in groups, which in some cases are detached from the principal collection. Thus the books in history and political science occupy a series of rooms over the main library; the

* The Johns Hopkins University Circulars, No. 42, September, 1885, contains a list of those then taken in; and a supplementary list appears in No. 46, January, 1886.

classical books are in rooms adjacent to the class-rooms for Latin and Greek; the Shemitic books are in the room devoted to the Shemitic seminary; and the laboratories have special collections adapted to their purposes. Many generous gifts have been received from time to time and acknowledged in the annual reports of the Librarian; but in looking back, no gift is so conspicuous as that of the library of the late Professor Bluntschli, of Heidelberg, which was purchased in 1882 by a few German citizens of Baltimore and presented to the Johns Hopkins University. It included 1,800 bound volumes and 3,000 unbound books and pamphlets, besides the manuscripts of Bluntschli, all of them interesting as mementoes of that distinguished publicist, and some of them (especially such as relate to the Swiss cantons) of historical significance.* To the manuscripts of Bluntschli, Mrs. Lieber soon added many of the manuscripts of his friend and correspondent, Dr. Francis Lieber, and a collection of his works.

Mention should here be made of the Stinnecke (or Bishop Whittingham) library, in ecclesiastical history and patristic literature, to which our historical students have access through the courtesy of the Bishop of Maryland and the librarian, Miss Whittingham. To the Maryland Historical Society and to other institutions of Baltimore we are also under constant obligations. From libraries at a distance we have often been permitted to borrow; and to the Army Medical Library of Washington we are particularly indebted for frequent loans, very willingly granted.

At the beginning of our institutional life it was determined to encourage the heads of departments and other qualified

*For an account of the Bluntschli Library, and the circumstances connected with its presentation, consult the Johns Hopkins University Circulars, No. 21, February, 1883.

scholars to contribute each in his own way to the advancement of the science which he professed; and in order that the results of such studies might be made public, the authorities have given their financial support to several journals, and occasionally to distinct publications. The first periodical to be established was the American Journal of Mathematics, to which Professor Sylvester, during a period of seven years, gave the benefit of his inspiring supervision. The ninth quarto volume is now in progress, and under the supervision of Professor Newcomb and Associate Professor Craig, the journal shows increasing vigor. Its recent numbers contain original papers by Sylvester, Cayley, Hermite, Poincaré, and other European contributors, as well as by our own mathematicians. The American Chemical Journal followed next, under the direction of Professor Remsen, and it has begun its eighth octavo volume. This journal is the repository of the contributions to chemical science which are made in the principal laboratories of this country. The American Journal of Philology, of which Professor Gildersleeve has been the sole editor, was the third journal here established, and it has reached its seventh octavo volume. In addition to original papers on philological subjects, the pages of this journal are open to criticisms and reviews. For a number of years the University contributed its financial as well as its scientific support to the Journal of Physiology, published in Cambridge, England. In addition, papers from the Biological Laboratory have been printed in a series edited by Drs. Martin and Brooks. Three volumes have been nearly completed. Four volumes of contributions to Historical and Political Science have been published by Associate Professor Adams, and an extra series, composed of memoirs too long for the original series, has recently been initiated. All the above-mentioned journals have been author-

ized by the Trustees. Two other periodicals, maintained by private enterprise, deserve to be mentioned here,—the Modern Language Notes, which are issued by Associate Professor Elliott and three of his colleagues, and the American Journal of Archæology, of which the managing editor is Professor A. L. Frothingham, now of Princeton College. The Johns Hopkins University Circulars, designed originally as bulletins for distribution among our own members, have become a convenient record of scientific work here in progress, and the circulation has, in consequence, extended far beyond our walls. The series has reached its fifty-first number, completing the fifth volume.

Among other publications to which the University has lent its support the following are noteworthy:—a collection of papers upon mathematical logic by Mr. C. S. Peirce and several of his pupils; a report of the lectures of Sir Wm. Thomson on Molecular Dynamics; a fac-simile of three pages of the Bryennios manuscript, known as the *Didache*, edited by Professor J. R. Harris; a fac-simile of seventeen pages of an inedited Syriac manuscript of the antilegomena epistles, edited by Dr. I. H. Hall; an excursion map of the neighborhood of Baltimore, for the use of naturalists and pedestrians; a history of oyster culture, by Dr. W. K. Brooks; reprints by him and by other writers of important morphological memoirs; and a photographic map of the solar spectrum by Professor Rowland.

In addition to the systematic courses of study here prescribed, many lectures have been given in Hopkins Hall to which the public have been admitted upon easy conditions, and to which the students have likewise been invited, though their attendance has been voluntary. During the earlier years of the decade, these lectures were a more significant part of

work than they have been of late. When the corps of resident teachers was small, valuable aid was received from distinguished professors in other colleges, each remaining for a month. We were under special obligations to the lecturers of the first year,—Lowell, Child, Whitney, Newcomb, Billings, Mallet, Hilgard, Cooley, and Walker. But of late years, Hopkins Hall has been totally inadequate for the reception of such audiences as wish to follow the courses here offered. By the good-will of the authorities of the Peabody Institute, we have sometimes been allowed to use one of the halls in their building, but there are serious objections to this arrangement, and we must await the construction of a suitable academic hall before this feature of our work can receive the attention which it justly deserves. Members of the resident faculty have frequently lectured in Hopkins Hall,—for example, Professor Gildersleeve during the first four years gave twenty lectures on Greek Lyric Poetry, twenty on Homer's Odyssey, twelve on Greek Prose Literature, and nine on the Greek Tragic Poets; and Professor Remsen in the course of one winter gave twelve lectures on the History of Chemistry; and Dr. Martin, in another year, twenty on General Biology. In the winter of 1880–1, by special request of the Trustees, a popular and well-illustrated course on select topics in science was given by Professors Remsen, Martin, Rowland, and Hastings. Five courses of instruction designed exclusively for those engaged in teaching have been given, viz.,—on Physiology, by Professor Martin, twenty lectures with practical exercises in the biological laboratory; on Elementary Zoölogy, by Dr. Brooks, fifteen lectures with laboratory work; on the Theory of Numbers, by Dr. Story, ten lectures; on improved methods of beginning the study of Latin, by Professor Morris, twenty exercises; on Early English,

by Mr. A. S. Cook, twelve lectures, on the basis of a simple Anglo-Saxon text. These courses were all restricted to a limited number of hearers, who entered their names and paid a registration fee of one dollar. Three courses, (twenty-nine lectures), on educational topics have been given by members of the resident staff to graduate students. Mention may also be made of a large number of lectures given by the invitation of the Peabody Institute, and also before various literary and educational institutions in Baltimore, by the professors of literature and science. The more noteworthy courses were at the Canton Institute, and before the workingmen of the Baltimore and Ohio Railroad at Mount Clare. The lectures in the last named series were printed.

The associations to which reference has been made are numerous,—but several of them are so important as to deserve more than a passing allusion. One of the first to be organized was the Philological Association, which meets once a month on Friday morning,—all the classes in language being given up at that hour and all the teachers, fellows, and advanced students, devoted to philology, being expected to attend. Professor Gildersleeve was designated as the first presiding officer and he has continued to hold that position. The Scientific Association is chiefly attended by those instructors, fellows, and advanced scholars who are interested in the various branches of mathematical and natural science. The presiding officer is chosen annually, and Professors Sylvester, Remsen, Martin, and Rowland have been successively elected. The meetings have been held on Wednesday evenings, usually in Hopkins Hall, and sometimes in one of the laboratories. The students in history and political science have been accustomed to meet weekly under the leadership of Dr. Adams, sometimes under the name of an association, and

sometimes under the name of a seminary, on Friday evening, originally in Hopkins Hall, but of late in that part of the library which is set apart for historical study. In addition to the papers presented by members of this company, informal addresses have been made and elaborate papers have been read by gentlemen not connected with the University.

Several years ago, at the suggestion of Professor Martin, the naturalists among us formed the "Baltimore Naturalists' Field Club," for the study of the flora and fauna, the rocks, minerals, and other natural characteristics of this region. In favorable seasons excursions are made on Saturdays to places of interest within easy reach of the city; meetings are held monthly to discuss what has been observed; and the collections are deposited in the cabinets of the University. One of the fruits of this activity has been the preparation of an excursion map of Baltimore and its vicinity, which was published by the University in 1884. The compilation of the map was undertaken by Mr. A. L. Webster, then a Fellow by Courtesy, and he was aided by the authorities of the U. S. Coast Survey and of the U. S. Geological Survey. A part of this map has been reproduced and colored to indicate the limits of an interesting geological region to the west of Baltimore, where Dr. Williams has been making a prolonged study of the gabbro formation. Mr. Uhler, of the Peabody Institute, has been a constant collaborator of the Field Club and by reason of his local knowledge has been particularly suggestive and helpful. Under his direction, photographs have been taken of several sites of geological interest which were likely to disappear with the growth of the town. Among these sites, Federal Hill should be named, where noteworthy fossils are found. During Professor Sylvester's residence here, the Mathematical Society held frequent meetings, but of late the activity of the mathe-

maticians has been more obvious in three seminaries, each guided by a different instructor, and each devoted to a different line of inquiry. For several years a metaphysical society was maintained, part of the time under the leadership of Mr. C. S. Peirce, and a part of the time under that of Professor G. S. Morris,—but the association is no longer maintained. The archæologists have had two organizations,—sometimes meeting as a purely local body to hear and discuss such communications as might be presented, and sometimes as the Baltimore Branch of the Archæological Institute of America. During two winters, Mr. A. L. Frothingham, of Baltimore, under the auspices of the local association, exhibited in one of our halls his collection of engravings and of Roman and mediaeval antiquities.

The societies just named have a semi-official character, their meetings being open to any member of the University and their proceedings being briefly reported. "Journal Clubs," for the perusal and discussion of the current periodicals, are regularly maintained by the chemists, the physicists, and the biologists, and less frequently by those devoted to other subjects. There are several other private clubs for systematic reading, and for conference. The undergraduates have maintained for several years a debating society which of late has observed the parliamentary forms of the House of Commons. A Christian Association is also maintaining a vigorous life and promises to become a more and more useful auxiliary.

Special mention will be made of the Chesapeake Zoölogical Laboratory, under the subject of Biology.

A few words may now be added in detail with respect to some of the departments of literary and scientific activity, especially in their more advanced phases. The distinction

here observed between university and collegiate work has already been pointed out, and should be borne in mind as the following pages are read. In speaking of each branch of study, I shall be aided by the suggestions and usually by the written communications of different members of the academic staff.

Let me begin with the study of Language and Literature. No one will be surprised that in planning for this side of the University, the first place was given to the Classics and especially to Greek; nor that the master who was placed at the head of these studies has had a strong and wholesome influence upon all the courses in languages. In response to an inquiry, Professor Gildersleeve has given me the following statement of the principles upon which he has worked.

"In organizing the classical department the importance of both sides, the scientific and the literary, was carefully considered. Without scientific study the cultivation of the literary sense is apt to degenerate into finical aestheticism; kept apart from the large and liberal appreciation of antique life in all its aspects, the scientific study of the classic languages divorces itself from sympathy with tradition and relinquishes its surest hold on the world of culture, on which the structure of the university must rest. The smaller the staff the more imperative is it that as far as possible each representative of the department should recognize the claims of all the provinces and not trust simply to the balance brought about by opposing forces. Each teacher should have a field for minute, exhaustive work, for as has been well said, "enthusiasm dwells only in specialization," and should have a broad range of vision for tracing the relations of his special province to the remotest corners of the philological domain. With the increase of teachers and of appliances much may be devolved on others. The head of the department may delegate this branch and that

to specialists, but any sound system of higher instruction must be a system of radiation from a scientific centre.

"The difficulty of keeping this combination of special and general steadily in view is much enhanced by the imperfect preparation of many of those who enter upon the university course. Not only have we no satisfactory system of secondary education, we have no uniform system and college graduates come to us with the most varied outfit, the most diversified deficiencies. To meet the trouble by the multiplication of classes is not a device suited to the university student, much of whose growth and enlightenment is due to the intimate contact with those who are of different capacity and far other attainments. All university students should work in common. The leader should assign no work that is without its lesson to the most experienced student or without its stimulus to the merest novice. Of course a problem like this cannot be reduced to working rules, but to recognize it clearly and to keep it steadily in view is in a measure to solve it.

"To these principles the department of classical philology has been true from the beginning. The advance of preliminary education may make the adjustment of the instruction an easier task in the future. But the principle of scientific specialization not only for the mastery of methods but for the joy and profit of individual achievement, and the other principle of wide and free vision must abide; and the history of the last ten years shows that the steadfast adherence to these lines of work has won for the university an influence that manifests itself far beyond the domain which it now occupies and which it has been persistently extending."

The following statement of the advanced work of the Greek Seminary during the last four years of our first decennium may serve to show how far these ideas have been carried out. It was prepared by Professor Gildersleeve.

In 1882–83, the centre of work was Aristophanes. The Wasps and the Frogs were interpreted by the members in turn and all the plays except the Lysistrata were analyzed and introductory lectures prepared by different members of the seminary. Studies were made in Aristophanic syntax and papers were read not only on syntactical topics, but on the First and Second Plutos, on Proverbs in Aristophanes, on Aristophanes' theory of comic art, on the character of Kleon, on the proportion of chorus and dialogue in Aristophanes, on Philonides and Kallistratos. Work begun the preceding year was carried on, notably an elaborate study of the predicative participle in Attic prose. In connection with the work of the seminary, Professor Gildersleeve conducted weekly readings during the latter part of the academic year in the Fragments of the Old Attic Comedy and delivered twelve lectures on Greek metres with especial reference to Aristophanes.

In 1883–84, the work was in the Greek historians. Select portions of Thukydides were interpreted in turn by the different members of the seminary, with lectures and illustrative papers by the Director and the students. Among the subjects treated may be mentioned: The composition of the different parts of the history of Thukydides, the principles that regulate the introduction of the Thukydidean speeches, use of the passive and middle in Thukydides, Thukydidean compounds, use of *θέρος* and *χειμών* in Thukydides, oracles in Herodotos, conditional sentences in Herodotos, the tract de Republica Atheniensium. The work of the seminary was supplemented by lectures of the Director on Greek Historiography, illustrated by readings and by an analysis of the treatises of Dionysios of Halikarnassos on the style of Thukydides.

In 1884–85, the seminary was occupied with the study of the Attic orators. In the seminary proper, which met twice a week during the academic year, the orators chiefly studied were Antiphon, Andokides, Lysias, Isaios, and Demosthenes. Especial attention was paid to the development of language and style, and to the antique canons of æsthetic criticism. The members were required to furnish in turn exegetical and critical commentaries on select portions of the orators, to make analyses of speeches and abstracts of rhetorical treatises. Of the investigations may be noted: The phraseology and syntax of the fifth oration of Antiphon, the style of Andokides' third as compared with the first and second orations, Thrasymachos of Kalchedon, comparative study of the Trapezitikos and Aiginetikos of Isokrates, synonyms in the orators, the use of the participle in Greek lyric poetry, on the language of the oracles especially in Herodotos, special studies in the vocabulary of Dionysios. This work was supplemented by the study, with critical exercises, under the guidance of the Director, of the rhetorical works of Dionysios of Halikarnassos, and by a course of lectures on the history of Greek oratory.

In 1885–86 (as in 1881–82), the work of the seminary centered about the study of Plato and of the literary form of Greek Philosophy. In the seminary proper, which met once a week during the academic year, the Euthydemos, the Theaitetos, and the Phaidros were interpreted by the members

in turn. Papers were presented, read, and discussed on the unity of Plato's Republic, on Dionysios' criticism of Plato's style, on the myth in Plato, on Plato's use of comparisons, on the peculiarities of the Timaios. One of the members engaged in an elaborate study of the ἅπαξ λεγόμενα in Plato; another was at work upon the literary use of the oath in the classic and in the Hellenistic period. With special reference to the work of the seminary, the director lectured once a week during the term on the Symposion of Plato, and a short course of lectures on the Platonic canon was followed by weekly readings in the Republic. Lectures on the History of Greek Philosophy were also given by Professor Hall.

Instruction in the Greek of the New Testament was first given by Mr. John M. Cross, one of the Associates. A few years later, Mr. J. Rendel Harris, of Clare College, Cambridge, who had shown his aptitude for palaeographic studies, and especially for the examination of manuscripts of the New Testament, gave a noteworthy impulse to such investigations, while holding the position of Associate Professor. After his resignation, Dr. Caspar René Gregory, now a privatdocent in the University of Leipsic, and editor of Tischendorff's Prolegomena, was invited to the vacant chair. It is expected that he will reside in Baltimore after the close of this academic year.

Dr. Minton Warren joined the University in 1879 and after a time organized his Latin Seminary on a plan similar to that which had been followed in Greek. His statements in the Register are here re-printed.

In 1882–3, Cicero was the author chosen. A preliminary course of six lectures was given on Cicero's life with special reference to his oratorical training and literary development. It was endeavored to show that certain marked differences existed between the style and language of the earlier and the later orations, and the lines which an investigation into such differences must follow were pointed out. The general characteristics of the epistolary style were discussed, an account given of the several collections of Cicero's Letters, their discovery in modern times, and the views now held in regard to the chief manuscripts. The orations were taken up in chronological order,—more particular attention being paid to the Pro Publio Quinctio, pro Roscio Comoedo, in Cæcilium Divinatio, in Verrem Actio Prima, pro Milone, and Philippica II. Analyses of speeches were prepared by members of the seminary; the commentary of Asconius to the

pro Milone was carefully studied, and a large portion of the pro Roscio Amerino was made the subject of critical interpretation. In the early part of the year several of the more difficult letters were taken up, on which members were required to present in turn a critical and exegetical commentary. Students were encouraged to do as much outside reading as possible, and after some acquaintance had been gained with the letters of Cicero, the attention was mainly directed in the latter part of the year to the letters of Cicero's correspondents. The letters of Sulpicius, Vatinius, Dolabella, Curius, Caelius, Plancus, and Marcellus were assigned to different members, and the results of detailed investigations into their peculiarities were embodied in papers and presented to the seminary. Papers were also read during the year on the characteristics of Vulgar Latin and on various points connected with the syntax of Cicero's letters.

In 1883–4, Terence was the author chosen. The plays were analyzed by the members of the seminary in turn, and a part of the Phormio and a very considerable portion of the Andria were made the subject of critical interpretation. Some twenty-five lectures were given by Dr. Warren on topics connected with the Roman drama, special attention being paid to the pre-Terentian literature, to the metres, and to the history of the text of Terence. Papers were presented embodying the results of special investigations by members of the seminary on the following subjects: on the Didascaliae, on the peculiarities of G. Sulpicius Apollinaris as shown in the Periochae, on the position of adjectives and possessive pronouns relative to their substantives, on the critical value to be assigned to the citations of Terence found in Nonius Marcellus, on some striking differences between the metres of Plautus and Terence and those of Greek Comedy, on Terence's use of substantives as compared with that of Plautus, on the relative value of the different MSS. of Terence and their characteristic peculiarities, on Terence's use of the present participle, on the cases of *ἀρχαϊσμός* specially remarked upon by Donatus.

In 1884–5, the Roman Satirists, especially Horace and Juvenal, formed the centre of work. Some of the fragments of Lucilius were read and discussed, select Satires of Horace and Juvenal were interpreted by the members of the seminary in turn, and papers were read by them embodying the results of special studies. Among the subjects thus treated were:—Juvenal's use of the gerund and gerundive, words borrowed from the Greek used by Horace and Juvenal, the use of the conjunction *cum* in Juvenal, the conditional sentence in Juvenal, the *sermo familiaris* as seen in Lucilius, Horace, Persius, Juvenal, and Petronius, the use of certain suffixes in Plautus, Terence, Lucilius, Persius, and Juvenal, the future active participle in Juvenal, the position of adjectives with respect to their substantives in Horace, the so-called Sulpiciae Satira, the use of the proposition *de* in Juvenal, the differences existing between the Satires and other works of Horace, some peculiarities of the Horatian Hexameter based upon statistics collected by members of the seminary.

In 1885–6, the centre of work was the Roman Historians, especially Livy and Tacitus. Select portions of Livy and Tacitus were made the subject of

critical interpretation by the members of the seminary, and papers were read by them embodying the results of special studies. Among the subjects thus treated may be noted: The use of *ob* and *propter* in the historians; the use of *frustra* and *nequiquam* in Livy; the use of the future active participle in Livy; chiasmus in Sallust; the constructions first found in Livy; the constructions first found in Sallust; the Carthaginian treaties; the authorship of the Bellum Hispaniense; also of the Eighth Book of the Bellum Gallicum, and the Bellum Alexandrinum; the style of the Bellum Africanum; the use in the Historians of *non modo—sed etiam, non solum . . . sed etiam; non tantum* and similar expressions; the genuineness of the Lives ascribed to Nepos; Hannibal's passage of the Alps; Vergil's influence upon Tacitus. In connection with the work of the Seminary, Dr. Warren gave a course of twenty lectures on the Roman historians from Fabius Pictor to Livy. In 1886–87, the centre of work will be Vergil.

The collegiate work in both Greek and Latin was guided by Professor C. D. Morris until his death in the spring of 1886. The coöperation of Dr. Warren in Latin began in 1879. Among the other teachers have been Mr. J. M. Cross, Dr. G. F. Nicolassen, and Dr. E. H. Spieker.

Mr. T. C. Murray, as an Associate, initiated the instruction in the Shemitic tongues, and continued to teach until his death occurred in 1879. Temporary instructors were engaged for the next few years. In 1883, Professor Paul Haupt, of the University of Göttingen, was invited to a professorship, and he has since organized the department of Shemitic languages upon a comprehensive plan. One of the Fellows in Shemitic studies, Mr. Cyrus Adler, prepared the following statement, which has been approved by Professor Haupt.

The work is arranged for a course of three years and embraces the principal Shemitic languages, Hebrew, Arabic, Ethiopic, Chaldee, and Syriac, as well as Assyriology in its various branches, viz.: Assyrian, Babylonian, and the non-Shemitic cuneiform idiom, Sumero-Akkadian. The centre of the work has been the Old Testament, special stress being laid on the critical study of Hebrew texts and the Cuneiform Inscriptions bearing on the Scriptures.

A. Hebrew. During 1883–84, portions of the Pentateuch were read and afterwards, at sight, some chapters from the books of Judges, Ruth, and Kings. Exegetical and critical problems were incidentally discussed. The

interpretation, however, was confined chiefly to a thorough philological analysis. In 1884–85, there was given a critical interpretation of Selected Psalms; especially the fifteen post-exilic, so-called, Songs of Degrees (Ps. 120–1341 Hebrew *Shîrê hamma'alôth, i. e.*, the Songs of the Return (from exile) were thoroughly explained and critically analyzed, with special attention to textual criticism, date of authorship, and constant comparison with the ancient versions of the Psalter. The Seminary also met regularly for the purpose of reading select historical texts. Similar studies were carried on during 1885–86, during which as many as six hours a week were devoted to the study of the sacred tongue.

B. Arabic. In the first year after a preparatory training in the sounds and forms, the first chapters of Genesis (R. Saadia's Arabic version) were read and then the opening suras of the Qor'ân as well as an easy historical text without vowels. In the grammatical analysis the forms and most important syntactical phenomena were thoroughly explained, with a constant reference to the points of contact as well as of difference with the Hebrew language. In order to make the students acquainted with the use of the national Arabic lexica, Arabic definitions, chiefly from the Qamûs, were given, and these served, at the same time, as exercises in reading unpointed sentences at sight. There were also composed by the students written exercises, conjugations of the more difficult irregular verbs, and translations of syntactically interesting sentences from English into Arabic. In 1884–85, there were read selections from Kosegarten's *Chrestomathia Arabica*, and the Arabic Chrestomathy *Majânî-el-adab* (Beyrut 1883, Imprimerie Catholique) principally extracts from the travels of Ibn Baṭûṭah and in addition to these, at sight, selections from the Chronicles of Abulfaraj, Fables, Anecdotes, etc. In 1885–86, there was read at first the voyages of Sindbad the sailor, from the Arabian Nights, and then some thirty selected extracts from the Arabian geographers Edrîsî, Abulfedâ, Ibn Baṭûṭah, Qazwînî, Ibn Ḥauqal, Ibn Sa'îd, el-Bekrî, etc., containing descriptions of the principal cities of Asia, Africa, and Europe.

C. Ethiopic. After some introductory lectures on the history of Abyssinia and the position of the Geez language in the cycle of the cognate idioms, the outlines of the grammar were given, and afterwards the reading and analysis of the *Narratiunculae de viris sanctis* in Dillman's *Chrestomathia Aethiopica* were entered upon. The legends of St. Mark, Melchizedek, Abbâ Salâmâ, and Yared were read, and the beginning of the story of Macarius. In the grammatical interpretation the gutturals were especially treated of, with occasional references to Amharic and Tigriña; and the close connection of the Geez language with Assyro-Babylonian was pointed out. In 1884–85, the whole book of Baruch was explained. This was preceded by a series of lectures on the comparative Grammar of the Geez language. In 1885–86, the *Sententiae e libro philosophorum excerptae* in Dillman's *Chrestomathia Aethiopica* were read and previous to this some of the *Narratiunculae de Viris Sanctis*, viz.: De Dionysio M. Patriarcha Alexandriae, De Macario M. and De Tacla Haimanôt.

D. Chaldee. The course in the Elements of Chaldee was not inaugurated until the second year. The forms were studied after the paradigm-tables in Baer and Delitzsch's edition of *Libri Danielis, Ezrae et Nehemiae* and the first chapters of the book of Daniel were read. This course was especially intended as a preparation for the study of Syriac, which was taken up the following year, the study of Chaldee being continued at the same time in the critical interpretation of the book of Ezra, not only of the Aramean portions, but also of the Hebrew chapters, with constant reference to the version of the LXX as well as the apocryphal book of Ezra ('Εσδρας α').

E. Syriac. In the Syriac course for beginners carried on during 1885–86, the first chapter of Genesis, as given in Nestle's Chrestomathy, was thoroughly explained with constant reference to Nöldeke's Grammar. At the same time there were, from the first, exercises in reading the Estrangelo writing. The pronunciation constantly followed, even in Western Syriac texts, was the Nestorian. After the principal grammatical phenomena in the first chapter of Genesis had been thoroughly mastered, select portions in Roediger's Chrestomathia Syriaca were read, chiefly extracts from the Syriac Chronicles of Gregory Bar Ebhrâyâ, and finally some parts of the Syriac Version (Peshita) of the New Testament.

F. Assyriology. a. Assyrian. In 1883-84, the principal facts of the grammar having been given in lectures, the cuneiform Annals of Sardanapalus (668–626 B. C.) in Vol. V of Sir Henry Rawlinson's *Western Asia Inscriptions* were read: the account of the first five campaigns, the two against Egypt, the third against Baal of Tyre, the fourth against Achsheri of Van, the fifth against Elam, and the beginning of the sixth against Shamash-shum-ukîn of Babylon, Sardanapalus' rebellious step-brother. In 1884-85, a course of lectures was first given on Comparative Assyrian Grammar, after which the cuneiform account of the campaign against the Arabians in the Annals of King Sardanapalus was studied. This was read and explained from beginning to end. In 1885-86, there were read of historical Assyrian texts the whole cylinder inscription of Esarhaddon (681–668 B. C.) and the Annals of Sennacherib on the hexagonal Taylor Clay Prism (705–681 B. C.), the account of the king's building operations and his first eight campaigns, with the exception of the often-treated third campaign against King Hezekiah of Judah (701 B. C.). Of the Nimrod Epic the whole sixth tablet was read in Haupt's edition, the same text having been partially treated in a special course for more advanced cuneiformists given during the session, 1883-84.

b. Babylonian. A course in Babylonian was not inaugurated until the third year, select inscriptions of Nebuchadnezzar, Neriglissar, and Nabonidus being read and also, at sight, some of the early inscriptions from Chaldea.

c. In *Sumero-Akkadian*, during the first year, the great three-columned Syllabary in Haupt's Cuneiform texts was explained. The principal phenomena of the phonology of the pre-Shemitic idiom were discussed. The origin of some Akkadian ideographs from the archaic Mesopotamian picture writing was traced and Akkadian words which have passed into Shemitic idioms,

especially into the language of the Old Testament, were pointed out. At the same time there were read, in an advanced course, select bilingual exorcisms, incantations, prayers, hymns, and penitential psalms in parts II and III of Haupt's Akkadian and Sumerian texts and in Vol. IV of Sir Henry Rawlinson's *Cuneiform Inscriptions*, with special reference to Akkadian syntax and to the dialectical variations in the ancient Proto-Chaldean idioms. In 1884-85, the syllabaries and vocabularies in the first part of Haupt's Cuneiform texts were finished, besides some bilingual Sumero-Akkadian texts were studied, especially the famous tablet containing the so-called Sumerian family laws. During the session 1885-86, at first the grammatical texts in the second part of Haupt's Cuneiform texts were studied, after which the interpretation of select dialectical bilingual Penitential Psalms in the third part of Haupt's texts was proceeded with. Finally a number of hymns and incantations in the fourth volume of Sir Henry Rawlinson's Cuneiform Inscriptions were read at sight.

Excepting some semi-popular lectures on Assyro-Babylonian Art and Archæology, and the reading of papers on various topics at the meetings of the Shemitic Society, no set course in Oriental History, Archæology, or Comparative Shemitic Philology was given. These subjects were rather treated in constant connection with the regular linguistic courses. Special stress was laid upon reading select texts in the different Shemitic languages, the grammatical phenomena in the various idioms being constantly studied from the standpoint of Comparative Shemitic Philology. During the third year, which principally aimed at giving the students a certain finish in their academic Shemitic studies, all the principal Shemitic idioms were read side by side in twelve different courses.

Professor Lanman, before his call to Cambridge, had charge of the instruction in Sanskrit. Dr. Bloomfield, who was appointed to the vacant chair in 1881, has aimed to meet the wants of those who were to become Indian philologists or comparative grammarians, and also of those who wish to have a broad basis for other philological study. The advanced work, to which the following summary by Associate Professor Bloomfield relates, is designed for the first mentioned class of students.

1882-3. The advanced work in Sanskrit was devoted to the *Vedas*. In the beginning an introductory course of lectures was given, sketching the position of the Vedas in the history and literature of India. The bulk of the year was devoted to the *Rig-Veda;* hymns most characteristic of the life, religion, and customs of the early Aryan Indians were read and

explained. Particular attention was given to the relation of the Vedic dialect to classical Sanskrit. The less advanced courses were devoted to grammar and the reading of the *Nala* and *Kathāsaritsāgara*. In Comparative Grammar two courses were given. First, on the comparative study of Greek inflections. This was introduced by a course of lectures, whose aim it was to exhibit the precise degree of certainty which is to be attached to the most important theory of Indo-European language history, namely, the theory of agglutination. The remainder of the course was carried on under seminary organization; the origin, form, and functional value of the verbal flectional elements being the subjects which received most attention. A second course was carried on in comparative grammar of Sanskrit. The special theme chosen was the representation of the two Indo-European series of gutturals in Sanskrit and Zend, with constant reference to the other cognate languages.

1883–4. The most advanced work in Sanskrit during the first half-year consisted in the study of parts of the unedited *Kāuçika-sūtra* and its commentary by *Dārila* in the original manuscripts. A second course was devoted to the interpretation of the drama *Çakuntala*. Here the main effort was directed toward the *Prākrit*, which was constantly analyzed and compared with Sanskrit. The same class read selections from the *Brāhmaṇa* literature toward the end of the year. The course introductory to the study of the Vedas described above was also repeated. Practical exercises in Sanskrit prose-writing were conducted during the second half-year. The elementary course was the same as in the preceding year. A course in the general principles of Comparative Philology was carried on throughout the year. It was introduced by ten lectures on the leading questions of Indo-European Comparative Grammar (phonetic law and analogy, agglutination, the questions attaching themselves to the relationships of languages, etc.). During the remainder of the year Whitney's "Language and the Study of Language" was made the basis of instruction, but this was constantly supplemented by lectures, which aimed to advance the subjects treated in the book up to the present day.

1884–5. The most advanced class in Vedic Sanskrit began with a short course in the *Brāhmaṇas*, restricting themselves to the characteristic selections in Lanman's Reader, which were thoroughly analyzed. The bulk of the year was devoted to an introduction into the *sūtra*-literature, and the relation of the *sūtras* to the hymns of the *saṁhitās*. Selections from *Āçvalāyana's grhya-sūtras*, including the hymns cited in them, were read, and their bearing upon Indian life and literature in general was discussed. A series of selections from the law book of *Manu* closed the work of the year. A second class in Sanskrit was conducted through a course of rapid reading in the *Hitopadeça* and *Kathāsaritsāgara*. The elementary class was made acquainted as rapidly as possible with the most essential elements of Sanskrit grammar; then five books of the *Nala* and about a dozen selections from the *Hitopadeça* were read and thoroughly analyzed. A course in Comparative Grammar of Greek was devoted especially to a detailed exposi-

tion of the latest theories on Indo European vocalism, and to a practical application of them to the body of the Greek language. Incidentally other important chapters of Greek Grammar, especially the guttural series of consonants and questions on accentuation, were treated. The most important phenomena in the vocalism of the principal related languages, Latin, Gothic, and Sanskrit, were also presented. A course in the general principles of Comparative Philology was carried on throughout the year, in the manner described in the preceding section.

1885–6. The advanced work in Vedic Sanskrit was devoted to the study of the first book of the *Atharva-Veda*, under circumstances especially noteworthy. A considerable amount of manuscript material hitherto unpublished, which the lecturer had collected for his edition of the *Kauçika-sūtra*, the ritualistic treatise of the *Atharva-Veda*, was brought to bear upon the exegesis of this book, not infrequently in such a manner as to yield results different from those previously attained by other scholars. The class was made acquainted with the advanced methods of textual and hermeneutical criticism. The second class in Sanskrit was conducted through a rapid course of reading in the *Hitopadeça* and *Kathāsaritsāgara* during the first half-year. During the second half-year the same class was introduced into the study of the *Rig-Veda*. The elementary class was conducted upon the same principle and with the same results as in the preceding year. A course in Comparative Grammar of Greek was introduced with a short course of lectures in which the relation of General Comparative Grammar to Greek Grammar was delineated. Most of the year was devoted to the detailed study of Greek Grammar upon the basis of Brugmann's Griechische Grammatik. This was carried on upon the seminary plan, each student taking his turn in handling the materials under discussion. A course in the general principles of Comparative Philology was carried on throughout the year as described under 1883–4.

Much attention has been given to the study of French and German, and the courses have been so arranged as to meet the wants first of those who wished to read and speak these languages; and next, of those who wished to become philologists in the Romance or in the Teutonic group. The German instruction was in charge of Professor Brandt, now of Hamilton College, until 1882. From 1882 to 1884 the courses were conducted by different instructors appointed temporarily. In 1884 the department was put in charge of Dr. Henry Wood, who reorganized the instruction, and has furnished the following statement of its scope.

The distinctive feature of the undergraduate course of the first year is that it aims to enable the student to read German prose at sight. Great stress is therefore laid upon the acquisition of a vocabulary, and the writing of German. The rudiments are required for entrance. In the second year, while a practical mastery of the language is still aimed at, the chief object is a more thorough grammatical and literary training, in the study of classical models of various styles.

The courses in both years have been arranged to meet the needs of graduate students in any department; and both graduates and undergraduates have the opportunity of learning to speak German, in a special class for conversation.

The centre of the graduate work in German is the historical and comparative study of Teutonic grammar. To this the reading of texts in the representative dialects has constant reference, from the beginning to the end of the course. The comparative study is intended also to contribute from the first to the efficiency of the work in each dialect by directing attention to the proper place and relative importance in the group of each linguistic fact.

The following is an abstract of the courses given during the years 1884-6.

Gothic. 1884–6. The course given was essentially the same in both years. Braune's Grammar was first studied and all the extracts read. Some knowledge of Anglo-Saxon being pre-supposed, the first object aimed at was to convert any Gothic form into the corresponding Anglo-Saxon and English form, with an explanation of the sound-changes involved, and conversely to trace back English or German to the extant or constructed Gothic forms. Linguistic material afforded by other special studies in Teutonics is made use of in this course. The morphology of Gothic was given in outline in eight lectures. The material thus far contributed to the subject of Gothic Syntax was criticised and utilized in the class as far as possible, and the comparative study of Teutonic Syntax was begun. Half of the Gothic texts were read in the class [editions of Heyne and Bernhardt].

German Comparative Grammar. 1884–5. The phonology of Gothic and Old High German formed the chief subject, and these, with Middle High German, received systematic treatment. The various helps for the philological study of each member of the Teutonic group were enumerated and criticised with some detail, as no satisfactory compendium is at present accessible.

Old High German. 1884–5. In the absence of a good hand-book, fifteen lectures on Old High German Morphology were given as supplementary to the lectures on Phonology in the course in Comparative Grammar. The following extracts from Braune's Lesebuch were read and explained: Nos. 4, 5, 9, 16 (Tatian), 17 (the Strassburg oaths), 28 (Hildebrand's lied), 29, 30 (Muspilli), 31, 33, 34, 35, 36, 39, 40, 41, and half of 32 (Otfrid).

Middle High German. 1884–5. Paul's Grammatik (2nd ed.) was gone through from beginning to end. Half of Walther von der Vogelweide (Wilmann's 2nd ed.) and one third of Hartmann's Iwein (ed. Benecke-

Lachmann) were read. Four lectures were given on Middle High German metre. 1885–6. The text used was Parzival. The third and fifth books, with one-half the first, were read and explained.

Old Norse. 1885–6. All the extracts given in Brenner's Handbuch (1882) were read. The same author's grammatical introduction was studied, and the phonology then more fully explained from Noreen's Grammatik (1884). All the parts of Rafn's Antiquitates Americanae pertaining to the voyages to Greenland, and part of those pertaining to America, were read in connection with the Grænlendinga þáttr.

Seminary. This was not organized until 1885–6. The work of the whole year was upon Low German. Twelve lectures were first given on the grammar of Old Saxon, and on the development of the forms into Middle Low German. The whole of the Heliand was then read (Heyne's ed.). The grammar of Middle and New Low German was then studied from Lübben and Nerger, and the following selections from Lübben's Middle Low German Chrestomathy were read: Nos. 2, 3, 6, 7, 11, 12, 13, 18, 19, 20, 24. The aim was from the first to take advantage of the position of Low German, between English and the other dialects, as a practical field for seminary work. The English dialects were compared with the Low German forms in different periods, and the results gained for the phonology, etymology, and language-history of both groups were carefully systematized.

In connection with the work of the Seminary, lectures on Old Teutonic Life were given weekly through the year: the subjects treated were Mythology and Folk-lore (17 lectures), Teutonic legal procedure (8 lectures), the Hall and the House (5 lectures), Ships and the Sea (3 lectures). In the lectures on Mythology recent theories were discussed as far as the time allowed. The chief aim of the course was to give, as far as possible, the characteristic environment of the individual in Teutonic countries, in the age when most of the early literature was produced.

Associate Professor A. Marshall Elliott has been in charge of the instruction in the Romance languages since 1876,—of late with the co-operation of Dr. H. A. Todd. The nature of their work is indicated by the following review which has been prepared by Mr. Elliott.

The character of advanced instruction in the Romance Languages has been chiefly philological up to the present year. We now have parallel courses in Literature (especially French) in which the sources are examined and critical tests of manuscript work applied and it is intended to strengthen this side of our university training as rapidly as circumstances will admit. The study, therefore, of the literary monuments, as mentioned below, must be understood to have particular reference to their philology. The bulk of the material used has been French, especially the older stages of this lan-

guage, and has been distributed into three chief groups: dialectic, phonetic, and morphological.

Phonetics and Dialects, as the main bulwarks of modern philology, have been two constant factors in this plan of studies. Each year, therefore, a course is given in French phonetics that are made the starting-point for later work in Comparative Romance phonology; each year, too, a course is offered in Dialects, beginning with those of the Langue d'Oïl and passing afterward to the Italian and Spanish. For the last three years, the Seminary work has centred upon the following general lines:

1883–4. The Anglo-Norman Dialect and the Oaths of Strasburg. For the former, Chardry's *Josaphaz* was taken up and studied in its relations to earlier works in this field, to the Franco-Norman and Isle-de-France productions of that time, attention being concentrated in the latter case upon the development of the French as contrasted with the Norman phonetic system. The *Oaths* were examined according to fac-similes of the MS. in their historical and linguistic relations to the Capitularia Regum, in their phonetics as bearing upon questions of later phonological growth, in their dialects and special morphological and syntactical characteristics. Three series of lectures were given through the year: (*a*) on Comparative Romance Grammar; (*b*) on Spanish and Portuguese Dialects; (*c*) on French Phonetics.

1884–5. As a continuation of the same line of work, of last year, on the Oaths, three selections were made from *Les plus anciens monuments français: the Cantilène de Sainte Eulalie, Fragment de Valenciennes* and a part of the *Passion du Christ*. The examination of these texts was on MS. fac-similes and bore upon both matter and form. Their mixed dialect character, their phonological and morphological relations to the Classic and Low Latin, to the oldest products of the other Romance Languages, to the later Old French Documents, and to the Modern French Language, formed the material with which the Seminary was occupied. In connection with the Eulalia Hymn, considerable time was spent in a study of the Latin Sequentia of the Middle Ages and of their relation to the literary forms that preceded and followed them. Two courses of lectures ran through the year: (*a*) on the Langue d'Oïl Dialects, (*b*) on Comparative Romance Phonology. In the first, the object was to give the leading characteristics of the chief dialect groups that constitute the North French. The system followed in carrying out this idea was, first, to put before the student, in short lectures, the distinguishing traits of each dialect, and, then, to follow these with selections of texts which were translated and their dialect peculiarities pointed out by the student himself. In the second, an attempt was made to group together the general laws bearing upon the same subject in Romance Phonetics, to note the action of like tendencies to law in different members of the group and to classify the more important differences of phonetic development according to their genetic relations.

1885–6. The work was confined to the Franco-Norman Dialect. It centred in the *Vie de Saint Alexis*, followed by the *Roman de Rou*, with a view of continuing the student on the same line of study pursued in 1883–4. The

mixed dialect character of these texts was especially considered and their phonological and morphological relations to the Classic and Low Latin, to the oldest products of the Romance Languages, to the later Old French documents and to the modern language, formed the material with which the Seminary was occupied. After the student had become acquainted with the characteristic traits of the Franco-Norman, he was constantly exercised in pointing out the morphological variations of the language from the Isle-de-France type and their general differences within strictly Norman territory; as, for example, the distinction of Franco- from Anglo-Norman forms, when such exist. In addition to these, two courses of lectures ran through the year: (*a*) Comparative Romance Morphology, (*b*) Old French Syntax. The former was intended to place students abreast of the present movement in Romance morphological science. To this end, as a convenient and accessible point of departure, Diez's *Grammatik der Romanischen Sprachen* was taken and attention particularly given to the advancement of this science since its time. Special contributions to Romance morphology, the latest theories and suggestions, as found in the editions of individual texts, with reference to the growth of special grammar categories and notably the influence of dialect, as represented in recent dialect investigations for the formation of morphological variation, were laid before the student for the different Romance idioms and the distribution of the work noted in each language.

An attempt was made in the lectures on Syntax, to present the more important features of word-arrangement for the earliest prose and for the thirteenth century poetry of Old French, in their agreement with the Latin, on the one hand, and variation from modern usage on the other. To this end, the general principles of sentence formation in non-inflected as contrasted with inflected languages were given and illustrated by examples drawn from the logical and grammatical construction; the relation of simple clause elements; word-setting in the sentence and, finally, sentence taxis, were discussed and the varying liberty of construction in semi-synthetic speech was constantly kept before the student.

English is studied, in the main, as French and German are studied, with the aim of attaining sound historical knowledge of the language and literature, correctness and ease of expression, and—by those who look forward to the career of teachers—with a view of acquiring the requisite scientific preparation. Dr. Browne, Professor Cook (now of the University of California), Dr. Wood, and Dr. Bright, have had most of the responsibility of this department. Courses of lectures upon English literature, supplementing or extending

the class-work, have been given by lecturers invited from abroad, as well as those attached to the academic staff. Among these may be mentioned those by Professor Child on Chaucer and on Ballads; those by the late Mr. Sidney Lanier, on the Science of English Verse, and on the Development of the English novel (both since published); those by Professor Corson on Modern English Poetry, on the literature of the Restoration, and on Shakespeare; and those by Mr. Gosse on the literature from Shakespeare to Pope.

The philological work in English, as now organized, may be seen in the following statement, prepared by Dr. Browne.

Advanced Courses. These courses are intended to meet the requirements of those who are aiming at special scholarship in English. Methods are employed by which the labors of past and contemporary scholars are made available, and by which the student may be led to individual research.

Anglo-Saxon and Middle English. The student will at once begin the grammatical study of the oldest period of English, and in the first year will be required to do the work represented by Sweet's *Anglo-Saxon Reader*. The next year he will pass to the more exact study of the leading Anglo-Saxon dialect (West-Saxon), using Sievers' *Old English Grammar*, edited by Prof. Cook, and reading a good portion of the best West-Saxon prose (such as Sweet's ed. of Alfred's *Orosius*); some of the minor poems (Wülker's *Kleinere Angelsächs. Dichtungen*); and later Anglo-Saxon miscellaneous prose (*Homilies*, etc.). The Grammar will be supplemented by constant regard to the subsequent development of the language in forms and syntax. The course in English of the twelfth and thirteenth centuries, carried on simultaneously, will connect organically with Anglo-Saxon on the one side, and with the language of Chaucer on the other.

Elements of Phonetics. In accordance with the doctrine that growth and changes in language rest upon the two-fold basis of physical and psychical laws, and that mental analogies only occasion phonetic possibilities, the elements of the science of the physical production of speech are introduced at the beginning of this course, where the student's own vernacular can be employed in direct practical application of the principles involved. The student will be taught to realize in practice the phonetic categories of language, and thus to arrive at a living definition of the terminology of the grammarian. Observation in this field will be restricted, primarily, to his own pronunciation, and to the various phases of his own language, and secondarily, to the next best known phenomena of German and French. A foundation will thus be laid for the more exact methods in the subsequent work of the course in Modern Languages.

History of the English Language. The outlines of this subject are imparted by means of text-books, supplementary lectures, and private readings. The aim is to enforce in a clear and orderly manner a sense of the historic continuity of the English Language.

First English Literature. The literature of the Anglo-Saxon period will be studied upon the basis of the treatise of ten Brink, amplified by the results of modern investigation and criticism.

English Literature. It will be seen that in the literary part of these courses the same idea of continuity prevails that is emphasized in the linguistic part. The student is first given a synoptical view of the whole field. In the major and minor courses the most important periods of literary production are studied, from the ninth century to the nineteenth. The history, manners, political and religious conditions, etc., of the people, are explained sufficiently to indicate the position of the chief writers of each period, and the influences under which they wrote.

For the fourteenth century, the central work will be in Chaucer and Langland; for the Elizabethan period, in Shakespeare; for the eighteenth, in Pope and the Essayists. A class of advanced students is also reading the early Scottish poetry, from Barbour to Lindsay.

The essays required of students are intended to promote the attainment of a good English style. The instructor is thus enabled to see the defects of each writer, and to give him the help and counsel that he needs, instead of laying down general principles from the lecturer's desk.

The importance of providing instruction in History was among the earliest subjects to engage the attention of the authorities, and distinguished lecturers were frequently invited here. The courses which were given by Chief Justice Cooley of Michigan, Professor von Holst of Freiburg, Professor Bryce of Oxford, Professor Freeman of Oxford, Professor Diman of Providence, and Professor F. A. Walker, now of Boston, are especially to be remembered. Professor A. Scott, now of Rutgers College, conducted a seminary in American History from 1876 to 1882, and Dr. H. C. Adams gave courses in Political Economy. But the organization of this department remained undefined, until Dr. H. B. Adams, one of the first to hold a fellowship, was called upon to direct it, first as an Associate, and afterwards as Associate Professor of History. The instruction in Political Economy was subse-

quently intrusted to Dr. R. T. Ely. Dr. J. F. Jameson has also been for several years one of the chief instructors in History. Without rehearsing the various steps of progress, the following note from Dr. Adams, indicates the present organization.

The instruction given in history and political science is now adapted to the needs of three classes of students: (1) all undergraduates, who require a general knowledge of history; (2) those undergraduates who wish to give special attention to history and political science during their course for the bachelor's degree; (3) graduate students.

All undergraduates, during their first year at the University, are required to attend an introductory historical course on ancient society and the origin of civilization; also exercises in historical geography. They must also elect one of two other historical courses, either that in classical history, which is adapted to the needs of classical students, or that in general European history, which is more suited to students of natural science, modern languages, etc. American history is required of all candidates for entrance to the matriculation examination, which, in history, is upon either ancient or modern ground, as the student may elect.

Those who enter upon the more special study of history (Group VI: — History and Political Science) are required to spend the first year in a study of classical historians, Herodotus, Thucydides, Livy, and Tacitus, to a large extent in the original texts. The second year is devoted to a study of church history in its relations with the Roman and German empires, to the history of Italy, France, and England. One year is spent upon political economy and one upon international law and the constitutions of England and the United States, all of which subjects are considered from an historical point of view.

Graduate students can now pursue a three years' course in history and political economy. The course of historical instruction is so arranged that each year the student is introduced to some representative field of ancient history the first half-year, and to some special subject of modern history the second half-year. For example, the class-work of 1884–5, the first half-year, embraced lectures on the early history of institutions and Greek politics; and the origin and rise of Prussia, the second half-year. In 1885–6, one half-year was devoted to Roman constitutional history and another to French Absolutism. In 1886–7, early Germanic Institutions are to be considered chiefly as an historical introduction to Anglo-American institutions, to which particular attention has been devoted, in seminary work, since the year 1879. Political Economy was taught in public lectures by Professor Francis A. Walker as early as 1877–8. The subject has been systematically developed by Dr. R. T. Ely since 1881. He now gives three annual courses: (1) Advanced Political Economy; (2) Finance and Taxation; (3) the

History of Political Economy, together with a course on the History of Commerce. Besides these extended courses in History and Political Economy, annual courses are now given in the history and principles of Roman Law, and also in the elements of historical criticism.

Since 1881, there have been good facilities for carrying forward original investigations in American institutional and economic history. A suite of convenient rooms, in which several thousand volumes of works in historical and political science, including the Bluntschli library, are now placed, is open all day. The instructors have offices adjoining the library, and are accessible at certain hours. On Friday evenings a general meeting of instructors and graduate students in history and political science is held in the Bluntschli library. Original papers are there presented and discussed, and addresses are sometimes made by specialists who may be invited to be present. Among the fruits of this department may be mentioned four volumes of historical and economic papers, originally communicated to the seminary, besides the following monographs independently printed: Congressional Government, by Woodrow Wilson; Icaria, by Albert Shaw; Mining Camps, by Charles H. Shinn; French and German Socialism and the Labor Movement in America, by R. T. Ely.

During a period of seven years, Professor G. S. Morris, of the University of Michigan, passed a part of every year in Baltimore, as a lecturer on the History of Philosophy and on Ethics. At the time of his appointment, his principal duty was to give public lectures on the History of Philosophy and related topics; subsequently he also gave private or class-room instruction to graduates and to undergraduates. Two of his public courses were printed, on "British Thought and Thinkers," and on "Philosophy and Christianity." Professor Stanley Hall began in 1882 to lecture in Psychology—a brief series of lectures having been previously given by Professor Wm. James, of Harvard University. Instruction in Logic was given during several years by Mr. C. S. Peirce. With the growth of the institution a resident professor was needed, and in 1884 Professor Hall was made Professor of Psychology and Pedagogics, and subsequently Mr. G. H. Emmott, a graduate of Cambridge, England, was made an Associate Professor of Logic and Ethics.

The following courses have been developed since the establishment of a resident professorship of Psychology and Pedagogics.

I. A two years' course of Pedagogy of one lecture per week with reading directed by the professor. The work of the first year is mainly historical and that of the second year is mainly devoted to the special topics of school work. The chief subjects treated and reference-lists used in this course have been printed [Descriptive Bibliography of Education, Boston, 1886, p. 309], in a form which may serve as a report of progress in the effort to work out an educational course adapted to the needs of an American university so largely engaged in the work of preparing young men for the work of higher and special instruction; and as a printed illustration of the way in which the instructor desires to treat each topic, reference may be found in a pamphlet entitled "How to Teach Reading and What to Read in School," p. 40, Boston, 1886.

II. Historical philosophy, in a three years' course of one lecture and a seminary per week, with reading courses and other exercises. The first year's work ends with Plotinus; that of the second year with Hegel; and the third year is devoted to recent and contemporary philosophical thought, including, as in the previous years, ethical, aesthetic, and religious philosophy, all treated from the standpoint of modern psychology and so far as is practicable, with references and reading in English.

III. A three years' course in Psychology, consisting of two lectures with reading club and seminary weekly and daily laboratory work. The first year is devoted to the senses considered experimentally and anatomically, but from the standpoint of Psychology, with reference to aesthetical and educational applications and to morbid phenomena, and concluding with an extended treatment of the field of binocular vision, with parallel reading of Helmholtz and Hering. The second year takes up first the four topics of space, the time-sense, physiological time, and the psycho-physic law, on each of which the vast body of recent experimental literature is epitomized as far as possible. The last half of the second year is devoted to association, memory, habit, attention, the will, and feelings successively, and treated experimentally. The third year is occupied with the topics of instinct in animals, psychogenesis in children, the psychological parts of anthropology (including animism, the chief mythic cycles, traditions, rites, and ceremonies) and morbid psychology (especially aphasia, hypnotic and allied states, paranoia, epilepsy, hysteria, paralysis, &c.) with constant reference to their anatomical correlations where such are made out, and to their educational, hygienic, and prophylactic applications.

The following publications of original research represent mainly the laboratory work of this department.

The New Psychology. G. S. Hall. (*Andover Review* and *Mind*, 1884). An introductory statement of the field and method.

Bilateral Asymetry of Function. G. S. Hall and E. M. Hartwell. (*Mind*, *No.* 33, 1883).
The Temperature Sense. H. H. Donaldson. (*Mind*, 1885).
Motor-Sensations of the Skin. G. S. Hall and H. H. Donaldson. (*Mind*, 1885).
A Study of Rythm. G. S. Hall and J. Jastrow. (*Mind*, 1885).
The Time-sense. L. T. Stevens. (*Mind*, 1886).
The Perception of Space by Disparate Senses. J. Jastrow. (*Mind*, 1886).
Gradual Increments of Sensation. G. S. Hall and Y. Motora.
Intermittent and Variable Sensory Stimulation. G. S. Hall and H. B. Nixon.
The two last-mentioned articles are completed but not yet printed.

Passing from Languages and Literature, I now take up the scientific branches, beginning with Mathematics.

Among the first appointments, Professor Sylvester, then of London, and now of the University of Oxford, was invited to the chair of Mathematics, a position which he retained during a period of seven years. His vigorous personality was felt in all the period of organization and, when he returned to England, was acknowledged by many tokens of the respect of his colleagues. Professor Newcomb was subsequently appointed to the chair of Mathematics and Astronomy. Drs. Story and Craig, associate professors, and Dr. Franklin, an associate, have borne important parts in the work of instruction and have made frequent contributions to the American Journal of Mathematics.

The following statement has been furnished at my request by Associate Professor Craig.

In the undergraduate or collegiate department the usual subjects have been given, viz: In the first year Conic Sections and the Calculus; in the second year Solid Analytic Geometry, the Theory of Equations including determinants, Spherical Trigonometry, and Differential Equations. It has frequently happened that undergraduates have, in their third year, taken some one or more of the graduate courses particularly the "Introductory Course" (see tabulated statement below). These general and standard courses have been supplemented from time to time by brief courses on special subjects according to the demand or necessity for such courses. In the graduate department, or university proper, with the exception of the "Introductory Course" started three years ago, no fixed system of courses has been given from year to year. The subjects given and the methods of treatment have depended largely upon the needs of the students in successive years. A glance, however, at the subjoined table will show that a

very large field has been covered. In pure Mathematics, Geometry has been represented by courses on the Theory of Higher Plane Curves, Twisted Curves, the Theory of Surfaces, Non-Euclidean Geometry, Quaternions, etc.; Analysis, by the general Theory of Functions, Elliptic, Abelian, and Theta Functions; and Algebra and Arithmetic, by extended courses in Modern Algebra, the Theory of Substitutions, and the Theory of Numbers. A great incentive to work in these directions was given by Professor Sylvester.

In Applied Mathematics, lectures have been given on Astronomy, Mechanics, Hydrodynamics, Elasticity, and a number of other subjects. With reference to the Applied Mathematics, it must be added that no attempt has been made to give instruction in the special branches of Mathematics needed for engineering.

In addition to the courses above mentioned, lectures have been given on a large number of other subjects, a little difficult to classify under any one of the general heads, *e. g.*, Finite Differences, Calculus of Variations, Spherical Harmonics, Bessel's Functions, Probabilities, etc.

In addition to the Mathematical Society which has met monthly and has been before referred to, three Mathematical Seminaries have been conducted under Professor Newcomb, Dr. Story, and Dr. Craig for the last three years.

During Professor Sylvester's residence here, lectures were given in the graduate courses in the subjects below named.

Courses of Instruction, hours per week, and attendance, 1876–83.

Determinants and Modern Algebra: Professor Sylvester, 1876–77, 2d half-year, 2 hrs., (7); 1877–78, 2 hrs., (5); 1878–79, 2 hrs., (3).

Theory of Numbers: Professor Sylvester, 1879–80, 2 hrs., (8); 1880–81, 2 hrs., (6); 1881–82, 1st half-year, 2 hrs., (7).

Theory of Partitions: Professor Sylvester, 1882–83, 2d half-year, 2 hrs., (10).

Algebra of Multiple Quantity: Professor Sylvester, 1881–82, 2d half-year, 2 hrs., (12); 1883–84, 1st half-year, 2 hrs., (6).

Theory of Substitutions: Professor Sylvester, 1882–83, 1st half-year, 2 hrs., (9).

Algebraical Geometry and Abelian and Theta Functions: Professor Cayley, 1881–82, 2d half-year, 2 hrs, (14).

Quaternions: Dr. Story, 1877–78, 2 hrs., (2); 1879–80, 3 hrs., (4); 1881–82, 3 hrs., (7); 1882–83, 2d half-year, 3 hrs., (4).

Higher Plane Curves: Dr. Story, 1880–81, 2 hrs., (5); 1881–82, 1st half-year, 3 hrs., (1); 1883–84, 2 hrs., (2).

Solid Analytic Geometry, (General Theory of Surfaces and Curves): Dr. Story, 1881–82, 2d half-year, 3 hrs., (1); 1882–83, 1st half-year, 3 hrs., (6).

Theory of Geometrical Congruencies: Dr. Story, 1882–83, 2d half-year, 2 hrs., (4).

Modern Synthetic Geometry: Dr. Franklin, 1877–78, 2 hrs., (2).

Theory of Invariants: Dr. Story, 1882–83, 10 lectures, (8); 1883–84, 3 hrs., (6).

Determinants: Dr. Franklin, 1880–81, 1st half-year, 2 hrs., (9); 1882–83, 20 lectures, (9).

Modern Algebra: Dr. Franklin, 1880–81, 2d half-year, 2 hrs., (6); 1881–82, 2d half-year, 2 hrs., (6).

Elliptic Functions: Dr. Story, 1878–79, 2 hrs., (2); 1879–80, (continuation of the previous year's course), 3 hrs., (4); Dr. Craig, 1881–82, 3 hrs, (8); 1883–84, 3 hrs., (4).

Elliptic and Theta Functions: Dr. Craig, 1882–83, 3 hrs., (10); 1883–84, 3 hrs., (2).

General Theory of Functions, including Riemann's Theory: Dr. Craig, 1879–80, 30 lectures, (2); 1880–81, 1st half-year, 3 hrs., (3).
Spherical Harmonics: Dr. Craig, 1878-79, 10 lectures, (6); 1879–80, 20 lectures, (6); 1881–82, 1st half-year, 2 hrs., (4); 1883–84, 2d half-year, 1 hr., (4).
Cylindric or Bessel's Functions: Dr. Craig, 1879–80, 10 lectures, (2).
Partial Differential Equations: Dr. Craig, 1880–81, 2d half-year, 2 hrs., (5); 1881–82, 2d half-year, 3 hrs., (9); 1882–83, 2d half-year, 2 hrs., (2); 1883–84, 2d half-year, 2 hrs., (4).
Calculus of Variations: Dr. Craig, 1879–80, 12 lectures, (9); 1881–82, 1st half-year, 2 hrs., (8); 1882–83, 1st half-year, 2 hrs., (6).
Definite Integrals: Dr. Craig, 1876–77, 1st half-year, 3 hrs., (5); 1882–83, 1st half-year, 2 hrs., (2).
Mathematical Astronomy: Dr. Story, 1877–78, 3 hrs., (2); 1882–83, 3 hrs., (2); 1883–84, 3 hrs., (2).
Elementary Mechanics: Dr. Craig, 1876–77, 2d half-year, (8).
Statics: Dr. Franklin, 1882–83, 2d half-year, 3 hrs., (5).
Analytic Mechanics: Dr. Craig, 1877–78, 1st half-year, (6); Dr. Story, 1880–81, 2d half-year, 2 hrs., (6); Dr. Craig, 1881–82, 1st half-year, 3 hrs., (8); 1882–83, 1st half-year, 3 hrs., (4); Dr. Franklin, 1883–84, 3 hrs., (6).
Theoretical Dynamics: Dr. Craig, 1878-79, 15 lectures, (6); 1883–84, 2 hrs., (5).
Mathematical Theory of Elasticity: Dr. Story, 1876–77, 2d half-year, 2 hrs., (4); 1877–78, 2 hrs., (2); Dr. Craig, 1881–82, 3 hrs., (4); 1883–84, 2d half-year, 2 hrs., (3).
Hydrodynamics: Dr. Craig, 1878–79, 24 lectures, (7); 1880–81, 1st half-year, 2 hrs., (6); 2d half-year, 4 hrs., (3); 1882–83, 2d half-year, 3 hrs., (5).
Mathematical Theory of Sound: Dr. Craig, 1883–84, 3 hrs., (5).

Subsequently, the following subjects have been treated:—

Courses of Instruction, hours per week, and attendance, 1884–86.

Analytical and Celestial Mechanics: Professor Newcomb, 1884–85, 2 hrs., (11).
Practical and Theoretical Astronomy: Professor Newcomb, 1885–86, 2 hrs., (9); 1886–87, 2 hrs., (7).
Theory of Numbers: Dr. Story, 1884–85, 1st half-year, 2 hrs., (9).
Modern Synthetic Geometry: Dr. Story, 1884–85, 1st half-year, 3 hrs., (8).
Introductory Course for Graduates: Dr. Story, 1884–85, 5 hrs., (10); 1885–86, 5 hrs., (7); 1886–87, 5 hrs., (10).
Modern Algebra, Dr. Story, 1884–85, 2d half-year, 2 hrs., (9).
Quaternions: Dr. Story, 1884–85, 2d half-year, 3 hrs., (8); 1886–87, 3 hrs., (5).
Finite Differences and Interpolation: Dr. Story, 1885–86, 1st half-year, 2 hrs., (5).
Advanced Analytic Geometry: Dr. Story, 1885–86, 3 hrs., (4); 1886–87, 2 hrs., (8).
Theory of Probabilities: Dr. Story, 1885–86, 2d half-year, 2 hrs., (5).
Calculus of Variations: Dr. Craig, 1884–85, 1st half-year, 2 hrs., (5).
Theory of Functions: Dr. Craig, 1884–85, 3 hrs., (5); 1885–86, 1st half-year, 3 hrs., (4); 1886–87, 3 hrs., (6).
Hydrodynamics: Dr. Craig, 1884–85, 1st half-year, 3 hrs., (6); 1885–86, 1st half-year, 3 hrs., (4); 1886–87, 1st half-year, 3 hrs., (4).
Linear Differential Equations: Dr. Craig, 1884–85, 2d half-year, 3 hrs., (3); 1885–86, 2 hrs., (4).
Mathematical Theory of Elasticity: Dr. Craig, 1885–86, 2d half-year, 3 hrs , (4).
Elliptic and Abelian Functions: Dr. Craig, 1885–86, 2d half-year, 3 hrs., (4); 1886–87, 1st half-year, 2 hrs., (6).
Problems in Mechanics: Dr. Franklin. 1884–85, 2 hrs. (5); 1885–86, 2 hrs., (6); 1886–87, 2 hrs., (8).

Among the lecturers above mentioned appears the name of Professor Cayley, the Sadlerian Professor of Pure Mathe-

matics in Cambridge, England, who was associated with his friend, Professor Sylvester, by the request of the latter, in the mathematical work of this University from January to June, 1882. During this period he gave a prolonged course on Algebraical Geometry and Abelian and Theta Functions. Many of these lectures were printed in the American Journal of Mathematics.

Two years later (in October, 1884) Sir William Thomson, of the University of Glasgow, gave a course of twenty lectures on Molecular Dynamics and especially the Wave Theory of Light, which were attended by the resident physicists and mathematicians, and by a large number of professors from other institutions, not enrolled on our register. These lectures were stenographically reported and published by the papyrograph-plate process.*

The instruction in Physics has been under the direction of Professor Rowland, assisted for several years by Professor Hastings, now of the Sheffield Scientific School of Yale College, and recently by Dr. Kimball and other associates. The many rooms set apart for this work are not connected and are adapted to investigations carried on by individuals rather than to the ordinary class-room work. The embarrassments, however, are now about to vanish. A large and commodious physical laboratory is nearly completed, and in the course of the current winter, will be occupied by those who are devoted to the study of Physics, Astronomy, and Mathematics. The liberal outlays which the trustees have made for the purchase and manufacture of physical apparatus and the comparative freedom which the Professor of Physics has enjoyed have

*See the Johns Hopkins University Circulars, No. 41, for an account of this course, by Professor George Forbes, of London.

enabled him to make important contributions to the science of Physics. Among other services, he engaged in the investigation of certain problems in electricity, under the auspices of the U. S. government, in accordance with the plans of the international conference of electricians which he has twice attended.

The following report respecting the work in Physics, was prepared by Professor Rowland.

At first attention was chiefly given to investigation and to the instruction of graduate students; but as the number of undergraduates has increased their requirements have been carefully regarded, while the facilities for investigation and for advanced instruction have constantly improved. Recently arrangements have been made for special instruction in applied electricity. An excellent mechanic has been in the employ of the university since the opening.

The first publication from the department was a paper "On the Magnetic Effect of Electric Convection" in which it was first shown that electricity, carried along on the surface of a moving body, produced magnetic action the same as if it was moving in a conductor. This was the result of an experiment carried out in Berlin. The first investigation attempted was a new determination of the mechanical equivalent of heat by a new method. This involved also a rigid comparison of the mercurial with the air thermometer and included not only a new value of the equivalent at one temperature, but at all temperatures from near the freezing point of water up to 30° or 40° C. The thermometers were then compared with those of Dr. Joule and thus his results were reduced to the air thermometer. The next subject of investigation was the value of the B. A. unit of resistance in absolute measure, a subject which has been taken up in late years by means of a large appropriation from Congress to aid in the establishment of an international standard. The complete report on the latter experiment has not yet been published but is now almost ready. The subject of the ratio of the electromagnetic and electrostatic units of electricity then occupied our attention, and a very complete and excellent determination was made which established the exact agreement of this quantity with the velocity of light. This investigation has as yet been withheld from publication in order to investigate a source of error in the determination which eluded us at the time. We then started a new subject, the action of a magnet on an electric current passing through the magnetic field, and this resulted in the discovery of an entirely new phenomenon which was finally connected mathematically with the magnetic rotation of the plane of polarization of light and the two shown to be one, on Maxwell's electromagnetic theory of light. Our attention was then given

to the ruling of gratings for optical purposes, and a machine was constructed by the mechanic which was entirely successful in ruling the largest and best gratings known up to that time. By ruling the gratings on a concave surface, the concave grating was produced, whose use in the measurement of the spectrum and its photography is gradually replacing all other methods. These gratings have been used in many important investigations both here and abroad, among which I may mention that of Langley in the determination of long wave lengths. Unfortunately, the machine was scarcely strong enough to rule the largest gratings, and so only three first-class ones of the largest size are now in existence, two being here and one at Harvard. To meet this want a larger and stronger machine is now being constructed. During several years we have been pursuing investigations with these gratings and have specially fitted up rooms in the new laboratory for their use. A complete map of the spectrum has been made photographically from the yellow of the spectrum to the extreme ultra violet,—and published in seven sheets. To put the whole subject in a more advanced state we have also made a new determination of the absolute wave length and also the relative wave length of several hundred lines throughout the spectrum to serve as standards. The relative wave lengths were measured by a new process with the concave grating, with an accuracy unattainable by any other method. All the lines below b down to A have also been measured with a view of producing a map of that region.

Many other investigations have also been completed, such as the electric absorption of crystals, the radiation from platinum at different temperatures, the wave length of the cadmium lines, etc. It has just been proved that the effect of the magnet on the chemical action on iron discovered by Professor Remsen is due to a true attraction of the magnet for the molecules of iron as they are dissolved by the acid.

Professor Remsen was called to the chair of Chemistry at the opening of the university, and has ably directed the work of the laboratory from that time on. Dr. H. N. Morse has been Associate Professor and Sub-director of the Laboratory, and other associates have been engaged for shorter periods of service. The American Chemical Journal, which has reached its eighth volume under the editorial management of Professor Remsen, has become the repository of contributions from the principal laboratories of the United States.

When the Howard street site was purchased, several chemists advised that a neighboring dwelling should be transformed into a temporary laboratory for chemistry, but as soon as the

transformation was considered, it was found best to begin at the foundation. A new building was accordingly constructed, which served for several years until the increasing company of students called for greater space. The Laboratory was enlarged in 1883, and is now occupied by more than a hundred students. A description of the building may readily be found in print.*

Professor Remsen has given me the following account of the principles which have governed the development of the courses in Chemistry.

The organization of the work in Chemistry has been carried on in the belief that it is better to train thoroughly a small number of chemists than to make a large number of mere analysts. Accordingly, the first part of the course is largely devoted to giving the student a broad knowledge of general Chemistry, both inorganic and organic. Analytical operations play an important part in the work of the first year, and it is only after a good knowledge of general Chemistry has been acquired, that analytical work is permitted. It is believed that the more thorough the chemist's knowledge of the pure science of Chemistry is, the better he will be fitted to deal with problems which present themselves, whether these problems pertain to the pure science or to so-called practical matters; and it is further believed that, unless the student has been called upon to solve some chemical problem requiring a considerable amount of time and labor, he will have an entirely erroneous conception in regard to the way in which problems are solved. Therefore an important part of the higher work in Chemistry consists in working upon some scientific problem and finally, when it is completed, writing a thesis upon the results. Usually about a year is devoted to this work. Besides this the attention of the student is constantly directed toward the sources of our information. Each one, during the last two years of his course, is called upon to give at least two lectures upon subjects assigned to him and the working up of which involves a careful study of the journals. Further, interest in the contents of current journals of Chemistry is kept up by holding journal meetings at which the instructors and advanced students report upon the various journals of the world.

In the laboratory there are constantly at work upon original problems a number of advanced students; and each year the results of their work are published in the American Chemical Journal and elsewhere. The work done during the past ten years has been largely in the field of organic Chemistry, though several investigations in inorganic and analytical Chem-

* See the Johns Hopkins University Circulars, No. 29, March, 1884.

istry have also been carried on. A series of papers on the "Oxidation of Substitution-Products of Aromatic Hydro-Carbons" has appeared, in which a broad and interesting generalization pertaining to the phenomena discussed is first brought to light. At present two new classes of substances known as Sulphinides and Sulphonphthaleïns are under investigation, and interesting results have already been reached in their study. Another line of work has had to do with the "Influence of Magnetism upon Chemical Action." In nearly all the original work carried on, the advanced students have taken part. While the work has been mainly in the field of pure Chemistry, problems of practical importance, that is such as bear directly upon matters of every day life, have received due attention. The principal work of this kind has been upon the water supply of Baltimore and Boston.

During several years, instruction in Mineralogy was given by Associate Professor Morse, to whose intelligent zeal the beginning of a mineralogical cabinet is due. In the year 1882–3, Dr. G. H. Williams joined the staff, and from that time on has given systematic instruction in general mineralogy, petrography, and inorganic geology. The laboratory work under his direction has been chiefly directed to microscopical petrography and physical mineralogy. Special attention has been given, as already intimated when the mineral collections were spoken of, to the basic massive rocks (hypersthene- and olivine-gabbros, and peridotites) occurring near Baltimore, as well as to the molecular and chemical changes which they have undergone. A report by Associate Professor Williams upon "the Gabbros and associated Hornblende Rocks," near Baltimore, has been published as Bulletin No. 28, of the U. S. Geological Survey. It includes a geological map of the area, and colored plates illustrating microscopic sections. These gabbros have also been traced and studied in their development in Harford County, Md., while the interesting questions involved in their metamorphism are at present being studied, under the auspices of the U. S. Geological Survey, in similar but more highly-altered rock masses in the neighborhood of Lake Superior.

Professor Martin was called from Cambridge, England, at the opening of the university, to organize the instruction in Biology,—a subject then almost unknown in American colleges. Its importance was recognized by the Trustees, partly as a basis for the prospective study of medicine. In distributing the biological work, physiology was taken by Dr. Martin, and morphology by Associate Professor W. K. Brooks. Three volumes of "Studies from the Biological Laboratory" have been printed under the editorial care of these gentlemen.

Rooms were first arranged for the biological workers over the Library, but the need of better facilities was soon apparent, and in 1883 a large and commodious Biological laboratory was constructed.* It is well equipped with the requisite apparatus. Professor Martin thus describes the purposes he has had in view in organizing this department:

The advance of knowledge during the twenty-five years immediately preceding the opening of the University has shown a much closer bond to exist between plants and animals than had hitherto been supposed. It had become clear that the study of living things was a single fundamental branch of science; and that individual plants and animals could only be understood when the study of them was based on a previous knowledge of the properties of living matter in general.

The Trustees therefore decided to commence, not by founding distinct chairs of zoölogy, botany, physiology, and so forth, but by appointing a professor of Biology, whose first duty it would be to so plan the biological work of the University as to ensure that every student taking the undergraduate biological course should have opportunity to learn the general characteristics of living matter, and have his attention directed rather to the underlying unity in plants and animals than to the comparatively trivial distinctions of species and genera. A leading principle in organizing the undergraduate teaching has been that it must not be technical or related directly to any professional pursuit. The aim has been to give a broad general training, on which he who should afterwards determine to become physician, government naturalist, pathologist, teacher of Physiology or Comparative Anatomy, might rely during his specialized profes-

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*For an account of this building, see the Johns Hopkins University Circulars, No. 30.

sional study. This example, much criticised at the time, has since been followed by several colleges.

Another important duty of the Professor of Biology was to coördinate the work in his department so that advanced students and those engaged in research should not only have special facilities in their own line of enquiry but also ready help from workers in other branches of Biology. The morphologist can often aid the physiologist by suggesting the animal or plant whose structure is best fitted for the study of some vital function; and the physiologist in turn can often aid the morphologist in interpreting structure. For such reasons our aim has been to keep in one building, under one general control, all the biological work, except that at the seaside laboratory, which administrative reasons made it desirable to place in the charge of the associate professor of Animal Morphology.

The biological department now affords opportunity for thorough elementary study of general biology, and of the fundamentals of systematic zoölogy and botany, and of animal physiology. Excellent opportunities are also afforded for advanced study in animal morphology and physiology, and the facilities for original research in those subjects are probably as good as can be found at any educational institution in the world. Advanced instruction in vegetable morphology and physiology has not yet been provided; but is much needed. Recent advances in microscopy make it desirable that we should look forward to employing a special instructor in histology and microphotography for advanced students.

The Chesapeake Zoölogical Laboratory was organized by Dr. Brooks for the promotion of observations of marine life on the sea-board, during the summer months. This station has been maintained for nine years, and has proved to be an excellent agency for the advancement of zoölogical science, and also for the training of observers. Scientific parties have engaged in researches during successive years, at the places below mentioned,—namely:

In 1878, at Fort Wool, near Fortress Monroe, Va., at the mouth of Chesapeake Bay;
In 1879, at Crisfield, Md., near the oyster beds, on the Eastern Shore of the Chesapeake;
In 1880, 1881, and 1882, at Beaufort, N. C., south of Cape Hatteras, and near Fort Macon.
In 1883, at Hampton, Va., near the entrance of the James River to the Chesapeake Bay;
In 1884 and 1885, again at Beaufort;
In 1886, on the coral island Abaco, in the Bahamas, W. I., with a secondary station at Beaufort.

Fifty individuals have been enrolled as workers in the laboratory, and the average attendance has been eleven persons in each year. The published results include ninety-nine papers, of which a detailed list has been printed.*

The plans of the University have always had reference to the establishment of a Faculty of Medicine whenever the Johns Hopkins Hospital should be completed. The noble group of buildings designed for the reception and treatment of patients will soon be ready to be occupied, and arrangements will then be perfected for instruction in surgery and medicine. Meanwhile, courses preliminary to the study of medicine, especially in physics, chemistry, and biology, with the modern languages, are provided in the philosophical faculty. Opportunities have also been given for the thorough study of morphology and physiology in the biological laboratory, and many medical men, as well as others who are looking forward to scientific professorships, have enjoyed these facilities. Another advance in this direction was made in 1884, by the appointment of Dr. Wm. H. Welch to be Professor of Pathology. Resigning the chair which he held in New York, he spent a year in Europe in the examination of medical institutions and in pathological work, and in the winter of 1885–6 he began his instructions in Baltimore by a course of lectures delivered before members of the medical profession, assembled in Hopkins Hall. At the same time by an arrangement with the Trustees of the Johns Hopkins Hospital, the autopsy house was furnished as a pathological laboratory. The building is of two stories, well lighted and arranged, and, in addition to

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*See the Johns Hopkins University Circulars, No. 54, for a review of the work from 1878 to 1886 prepared by Dr. Brooks, with lists of members and of publications.

the room appropriated to autopsy, includes a theater for demonstrations and nine working rooms.

In January, 1886, the rooms in the upper story were ready for occupation, and at the beginning of the present academic year (October, 1886) the entire laboratory was opened for the reception of students and the beginning of systematic instruction in pathology. Certain rooms are devoted to work in pathological histology and to pathological demonstrations, others to bacteriological work, and others to experimental pathology. In addition, there are a museum and rooms arranged for microscopical photography. The museum is already supplied with a considerable number of valuable pathological specimens.

The laboratory is well equipped with apparatus for teaching and for investigation in all branches of pathology, including bacteriology.

There are at present seventeen physicians enrolled as students of pathology in the laboratory, some of whom are engaged in special investigation and others as attendants upon the regular courses of instruction. These courses comprise classes in pathological histology, in pathological demonstrations, in methods of making post-mortem examinations, and in bacteriology, and didactic lectures.

A fellowship in pathology has been established and an appointment to this position has already been made.

The nucleus of the medical faculty, as now constituted, includes the president of the University, a professor of pathology, a professor of physiology, a professor of chemistry, a lecturer upon hygiene, and an associate in pathology. Other chairs for scientific and clinical instruction are yet to be established. By an agreement with the trustees of the Bay View Asylum, the alms-house of this city, the faculty is represented

in the care of the sick poor, and especially of the insane poor, by visiting physicians, formally designated for the purpose.

The report now made of the general administration of this foundation and the particular statements which have been added with respect to the progress of the several departments will enable the Trustees to see what results have followed from the encouragement they have given to the principal subjects of literary and scientific activity lying without the domain of professional schools. In science, mathematics, astronomy, physics, chemistry, mineralogy and geology, biology, physiology, morphology and pathology, are here taught; the study of Greek, Latin, Sanskrit, Hebrew, Arabic, and the other Shemitic tongues, and of various languages in the Romance and Teutonic groups, including Anglo-Saxon and English, has been promoted with equal zeal; logic, ethics, psychology, pedagogics, and the history of philosophy have had their recognition; and attention has been given to some of the branches of historical and political science, including institutional history, political economy, sociology, and Roman Law. This is enough to show that Science and Literature have received from the authorities an equal amount of attention, and that there has been no neglect of the old, because it was old, nor indifference to the new because it was new. Academic degrees of the same significance have been bestowed upon those who have become proficient in different studies.

The instructors of the University have been encouraged to coöperate in other associations and agencies for the promotion of science and education where their aid has been sought; and particularly to attend whenever they could meetings of the literary and scientific societies to which they severally belong. It requires some resolution to participate, year after year, in

such associations, but I am sure that the results are likely to reward the effort. In this country there is no acknowledged scientific capital, (like London, Paris, Berlin, or Vienna,) to which the men of science and letters are necessarily drawn during some period of the year, and consequently the annual meetings of specialists, held in different places and at different seasons, are particularly useful in bringing together those who are devoted to kindred pursuits and in enabling them to plan for mutual coöperation. Several of these associations it has been a pleasure to welcome to Baltimore.

The Trustees contribute yearly toward the maintenance of the School of Classical Studies in Athens, and have taken a table in the laboratory of the U. S. Fish Commission at Wood's Holl. They have also on several occasions encouraged members of the academic staff to give their services to the public by carrying on important scientific inquiries. Among these may be mentioned an investigation of the impurities of drinking water, which was made for the municipal authorities of Baltimore, and afterwards for those of Boston, by Professor Remsen; a prolonged study of the propagation of oysters in the Chesapeake Bay, which was made by Dr. Brooks, as a member of a commission appointed by the State of Maryland, and his discovery of a method of oyster culture; two visits to Paris (in successive years) which were made by Professor Rowland as one of the delegates of the U. S. Government to the International Congress of Electricians, and his subsequent experiments for the establishment of an international unit of electrical resistance, with the aid of a government grant; the participation of Professor Hastings in the United States Astronomical Expedition to the Caroline Island, in 1883, for the purpose of observing the solar eclipse; and the repeated investigations in the field which Dr. Williams has carried on, as a member of the U. S. Geological Survey.

After all the apparent liberality of outlay, it will surprise not a few of those who read this report to learn that our funds are far, very far, from being equal to the necessities of a great university; and that our resources are by no means equal to those which are possessed by certain other institutions in this country. If within the next few years our income could be doubled, how much more might be accomplished, what additional chairs could be established, what new discoveries could be made, what new subjects could be taught, what convenient rooms could be built, what collections could be brought together of instruments and books. Is it not worth the while of those who may be contemplating generous gifts for the public good to consider the establishment of special departments in the University of Baltimore, or the provision for some particular want? A medical college is one of the earliest necessities. Buildings for other purposes are also needed, and especially, (as I have said before), a good academic structure with suitable halls for large audiences as well as for ordinary classes. The demand for books is without limit, and can only be understood by those who are engaged in thorough study. In accordance with the spirit of the day, this institution should give its encouragement to the education of women, but special funds are needed for that purpose. An historical and archæological museum would be very welcome. Many other desiderata are in mind, but these are doubtless more than sufficient indications of the uses to which money might be applied.

Here I close this decennial review, and I look to the future in confidence that with the blessing of Providence the efforts here put forth to establish a university will continue to prosper. I foresee that generations of young men will here be trained "for the service of church and state," and for the promotion of many branches of learning, both literary and

scientific. Improvements are sure to be made in the plans which have been adopted,—new methods employed, new chairs established. Other Faculties will be organized. But I hope that those who have occasion to look back on the earliest years of this foundation, will discover that earnest endeavors have been put forth for the advancement of knowledge and for the strengthening of intellectual and moral character.

All students are aware that institutions of learning cannot be created, and that they cannot be perfected by the efforts of any set of men. They inherit tendencies; and their growth is promoted or hindered by influences beyond the control and even beyond the recognition of trustees and faculties. They are the exponents of the thought of the times,—sometimes leading, sometimes led by the spirit of the age, but they are also the exponents of past experience, the heirs, the interpreters, and the defenders of ideas and principles which have been established. If it is their duty to "prove all things," it is equally incumbent upon them to "hold fast that which is good." If it is their duty to seek out and announce the laws by which the material world is governed, it is also their duty to uphold "the evidence of things not seen." If they ought to study the environment in which man is placed, they must also study his spiritual nature. If they observe the physical and biological laws by which humanity is governed, they must also study the historical, political, and moral forces by which the race advances to higher civilization. If they encourage the observation of phenomena and the discovery of law, they must likewise quicken the love of poetry and of art, of philosophy and of religion.

Science is rapidly lifting the mist which has rested upon the

conditions in which the human race is placed; every new and fundamental discovery is fraught with world-wide benefits, sooner or later to be developed. Those who stand nearest the out-posts of advancing knowledge are the most impressed by problems which still allure attention in the unexplored domain beyond their sight; and it is they who find in the history of discovery the strongest incentives to continued research. It is not strange that many people are perplexed, and some bewildered, by the changes of which they hear and by those which they anticipate, nor that some well educated and thoughtful persons find it hard to discriminate between hypotheses and theories boldly affirmed by dogmatic writers, and the records of observed phenomena and the announcement of laws which may be verified at any time and any where. All this cannot be avoided. But let it be remembered that what is said of science is true in other domains of thought; it is nowhere easy to distinguish between truth and assertion.

The progress of science does not touch or touches only to fortify the citadel of man's spiritual nature. On themes like these, one should speak with the reserve which belongs to all that is most sacred; yet I do not hesitate to express the conviction that man's consciousness of his own personality, with its freedom and its responsibility; his belief in a Father Almighty; his hopes of a life to come; his recognition of a moral law and of the authority of an inward monitor, will stand firm, whatever discoveries may be made of the evolution of life, the relation of soul and body, the nature of atoms and of force, and the conceptions of space and time. Science shows us that all knowledge proceeds from faith,—the assumption of premises in which the investigator believes. Indeed if I may use the words of another, "some of these very discoveries on closer and larger view seem destined to be the chief support of

those cherished convictions to which they at first seemed hostile." I anticipate that the day is not distant when apprehensions now felt will be felt no more, and when science will be openly proclaimed the handmaid of religion, and the ally of good government.

These remarks have here been introduced to allay the anxieties of many friends of liberal education who read and hear what seems to them opposed to the development of spiritual life, and because I wish to record my belief that universities and colleges are the defenders of ideality, that their dominant and general influence has been to keep before mankind the remembrance of great ideas. The phrases in which these ideas are uttered vary with the different circumstances of various epochs, but they have rarely if ever failed to include an acknowledgment of man's religious and spiritual nature and of the value of intellectual and moral character; a recognition of the brotherhood of man; a belief in the supremacy and continuity of Law; and a sense of the humility which is demanded in the presence of the Infinite.

It often seems a misfortune that the preferences and claims of religious denominations and especially of Christian churches are so strong that they cannot unite in upholding and in promulgating those ideas upon which they are agreed, and which need united enforcement against low aims and selfishness, the common enemies of culture and of faith. This needless divergence has led in this country to an indefinite multiplication of institutions for the promotion of collegiate and university studies. A foundation which has no distinctive religious name is therefore liable to be misunderstood, if not misrepresented. But I believe it is possible for such a university to be maintained in a thoroughly loyal Christian spirit, because the ideals of spiritual life which were upheld by the Great Teacher of

mankind are reverently accepted, and the duties which he enjoined are reverently obeyed. By him we are taught to seek the truth and to love freedom; his words are the motto of this foundation: "the Truth shall make you free."

In conclusion, I beg leave to thank the Trustees for their unfailing coöperation and encouragement, and to express my respect for the fidelity, the enthusiasm, and the learning of the academic staff. It is to them that this foundation owes its position in the world of letters. The researches they have made and the contributions to knowledge which they have published, justify the freedom which the Trustees have allowed them. May I express the hope that in future, this important function of a university, the advancement of knowledge, will never be obscured. May I also bring to mind, and adopt as my own, the words of one who represented the oldest American university when our plans were first publicly announced, and who said at that time, "Here may young feet, shunning the sordid paths of low desire and worldly ambition, walk humbly in the steps of the illustrious dead—the poets, artists, philosophers, and statesmen of the past; here may fresh minds explore new fields and increase the sum of knowledge; here, from time to time, may great men be trained up to be leaders of the people; here may the irradiating light of genius sometimes flash out to rejoice mankind; above all, here may many generations of manly youth learn righteousness."

Respectfully submitted to the Trustees, at their meeting on the sixth of December, 1886.

DANIEL C. GILMAN.

APPENDIX.

INCLUDING STATEMENTS WHICH PERTAIN TO THE YEAR 1885–6.

A. LIST OF THESES OF THE DOCTORS OF PHILOSOPHY, 1878-86.

Toward the conclusion of the courses of study which lead to the degree of Doctor of Philosophy every candidate is required to prepare a thesis on some subject pertaining to his principal study. This thesis is referred by the Board of University Studies to some competent judge or judges, and without the approbation of such a judge, and the consent of the Board, no thesis is accepted. In the following list, the date indicates the year when the candidate graduated. When the paper was printed, the place of publication is mentioned.

HENRY CARTER ADAMS. (1878.)
History of Taxation in the United States, 1789–1816. (*Studies in Historical and Political Science, Vol. II,* 1884; *Zeitschrift für d. gesam. Staatswissenschaft, Tübingen, Vol.* 35, 1879.)

WILLIAM JOHN ALEXANDER. (1883.)
Participial Periphrases in Attic Prose. (*American Journal of Philology, Vol. IV,* 1883.)

FRANCIS GREENLEAF ALLINSON. (1880.)
Ionic Forms in the Second Century, A. D., and the Obligations of Lucian to Herodotus. (*American Journal of Philology, Vol. VII,* 1886.)

WILLIAM SHIRLEY BAYLEY. (1886.)
Contact Metamorphism in the Slates and Sandstones of Pigeon Point, Michigan.

EDWARD WEBSTER BEMIS. (1885.)
Local Government in Michigan and the Northwest. (*Studies in Historical and Political Science, Vol. I,* 1883; *American Social Science Association, Transactions,* 1882.)

LOUIS BEVIER. (1881.)
The Genuineness of the First Antiphontean Oration. (*Abstract in the Johns Hopkins University Circulars, No.* 10, 1881.)

GUSTAV BISSING. (1885.)
Notes on Gauss' Coordinates, and Steiner's Quartic Surface.

MAURICE BLOOMFIELD. (1879.)
The Noun-Formation of the Rig Veda. (*American Oriental Society: Proceedings, October,* 1878; *Journal, Vol.* 11.)

JAMES WILSON BRIGHT. (1882.)
A Discussion of the Verbal Forms in King Alfred's West-Saxon Version of Gregory's Cura Pastoralis.

ADAM TODD BRUCE. (1886.)
Observations on the Embryology of Insects and Arachnids. (*Abstract in the Johns Hopkins University Circulars, No.* 49, 1886.)

SAMUEL FESSENDEN CLARKE. (1879.)
(1) The Development of Amblystoma; and (2) A Report on a Collection of Deep Sea Hydroids from the Gulf of Mexico. (*Studies from the Biological Laboratory, Vol. I,* 1879–80, *and Vol. II,* 1882–1883; *Museum of Comparative Zoölogy, Cambridge, Mass., Bulletin,* 1879.)

ROBERT DORSEY COALE. (1881.)
Sulphamine and Sulphoisophthalic Acids. (*American Chemical Journal, Vol. III,* 1881–1882.)

HERBERT WILLIAM CONN. (1884.)
Life-history of Thalassema Mellita. (*Studies from the Biological Laboratory, Vol. III,* 1884.)

THOMAS CRAIG. (1878.)
The Representation of One Surface upon another; and on some Points in the Theory of the Curvature of Surfaces. (*American Journal of Mathematics, Vol. III,* 1880; *and Vol. IV,* 1881.)

ELLERY WILLIAM DAVIS. (1884.)
Parametric Representation of Curves. *American Journal of Mathematics, Vol. V,* 1882.)

DAVID TALBOTT DAY. (1884.)
Changes Effected by Heat in the Constitution of Ethylene. (*American Chemical Journal, Vol. VIII,* 1886.)

WILLIAM CATHCART DAY. (1883.)
The Oxidation of β-Cymenesulphamide. (*American Chemical Journal, Vol. V,* 1884–1885.)

JOHN DEWEY. (1884.)
The Psychology of Kant. (*Journal of Speculative Philosophy, April,* 1884.)

DAVIS RICH DEWEY. (1886.)
History of American Economic Literature previous to the time of Henry C. Carey.

HENRY HERBERT DONALDSON. (1885.)
The Temperature Sense. (*Mind, Vol. X, No. XXXIX, July,* 1885.)

JAMES REYNOLDS DUGGAN. (1884.)
Fermentation.

LOUIS DUNCAN. (1885.)
The Determination of the Ohm by the Lorenz Method.

WILLIAM PITT DURFEE. (1883.)
Symmetric Functions. (*American Journal of Mathematics, Vol. V,* 1882.)

GEORGE STETSON ELY. (1883.)
Bernouilli's Numbers. (*American Journal of Mathematics, Vol. V,* 1882.)

WILLIAM HENRY EMERSON. (1886.)
Oxidation in the Aromatic Series. (*American Chemical Journal, Vol. VIII,* 1886.)

EDWARD ALLEN FAY. (1881.)
Conditional Relations in the Romance Languages.

LAWRENCE BUNTING FLETCHER. (1881.)
The Determination of the Mechanical Equivalent of Heat by Electrical Means. (*Philosophical Magazine, 5th series, Vol. X,* 1880.)

JOSEPH AUGUSTE FONTAINE. (1886.)
History of the Use of the Auxiliaries in the Transitive, Neuter, and Reflexive Verbs of the Romance Languages.

FABIAN FRANKLIN. (1880.)
Bipunctual Co ordinates. (*American Journal of Mathematics, Vol. I,* 1878.)

SAMUEL GARNER. (1881.)
Gerundial Construction in the Romance Languages.

ELGIN RALSTON LOVELL GOULD. (1886.)
Local Government in Pennsylvania. (*Studies in Historical and Political Science, Vol. I,* 1883.)

EDWIN HERBERT HALL. (1880.)
New Action of Magnetism on a Permanent Electric Current. (*American Journal of Mathematics, Vol. II,* 1879; *American Journal of Science, Series* 3, *Vol.* 19 and 20, 1880.)

GEORGE BRUCE HALSTED. (1879.)
Basis for a Dual Logic.

EDWARD HART. (1879.)
Nitrosulphobenzoic Acids and their Derivatives. (*American Chemical Journal, Vol. I,* 1879–1880.)

EDWARD MUSSEY HARTWELL. (1881.)
Notes on some Points in the Anatomy and Physiology of the Slider Terrapin (Pseudemys rugosa).

HOMER WINTHROP HILLYER. (1885.)
Methods of Determining the Relative Stability of the Alkyl Bromides. (*American Chemical Journal, Vol. VIII,* 1886–1887.)

WILLIAM PENN HOLCOMB. (1886.)
Pennsylvania Boroughs. (*Studies in Historical and Political Science, Vol. IV,* 1886.)

WILLIAM HENRY HOWELL. (1884.)
Experiments upon the Blood and Lymph of the Terrapin and the Origin of the Fibrin formed in Coagulation. (*Studies from the Biological Laboratory, Vol. III,* 1885.)

WILLIAM WHITE JACQUES. (1879.)
Distribution of Heat in the Spectra of Various Substances. (*American Academy of Arts and Sciences, Proceedings* (*May,* 1878–*May,* 1879), *Vol.* 6 *of new series.*)

HANS CARL GÜNTHER VON JAGEMANN. (1884.)
Anglo-Norman Vowel System in its Relations to the Norman Words in English. (*American Philological Association, Transactions, Vol.* 15.)

JOHN FRANKLIN JAMESON. (1882.)
Origin and Development of the Municipal Government of New York City. (*Magazine of American History, Vol. VIII,* 1882.)

JOSEPH JASTROW. (1886.)
The Perception of Space by Disparate Senses. (*Mind, London, October,* 1886.)

EDWARD HARRISON KEISER. (1884.)
The Existence of Active Oxygen. (*American Chemical Journal, Vol. IV and V,* 1882–1884.)

GEORGE THEOPHILUS KEMP. (1886.)
The so-called "New Element" of the Blood and its Relation to Coagulation. (*Studies from the Biological Laboratory, Vol.* 3, 1886.)

ARTHUR LALANDE KIMBALL. (1884.)
Value of the B. A. Unit of Electrical Resistance in Absolute Measure.

MITSURU KUHARA. (1882.)
Oxidation of Nitrometaxylene. (*American Chemical Journal, Vol. III,* 1881–1882.)

FREDERIC SCHILLER LEE. (1885.)
Arterial Tonicity.

CHARLES HERBERT LEVERMORE. (1886.)
The Republic of New Haven. (*Studies in Historical and Political Science, Extra Vol. One,* 1886.)

GUSTAV ADOLPH LIEBIG, JR. (1885.)
Variation of the Specific Heat of Water. (*American Journal of Science, Series* 3, *Vol.* 26, *July,* 1883.)

GONZALES LODGE. (1886.)
The Participle in Euripides.

JAMES PLAYFAIR MCMURRICH. (1885.)
Osteology and Myology of Amiurus catus (L.) Gill. (*Canadian Institute, Toronto, Proceedings, New Series, Vol. II,* 1884.)

ROBERT W. MAHON. (1882.)
Some Investigations on the Benzyl-derivatives of the Sulphamides of Metaxylene. (*American Chemical Journal, Vol. IV,* 1882–1883.)

ALLAN MARQUAND. (1880.)
The Logic of the Epicureans. (*Studies in Logic, J. H. U., Boston, Little, Brown & Co.,* 1882.)

CHARLES WILLIAM EMIL MILLER. (1886.)
The Participle in Pindar.

OSCAR HOWARD MITCHELL. (1882.)
Some Theorems in Numbers with a Generalization of Fermat's and Wilson's Theorems. (*American Journal of Mathematics, Vol. IV,* 1881.)

KAKICHI MITSUKURI. (1883.)
Structure and Significance of some Aberrant Forms of Lamellibranchiate Gills. (*Studies from the Biological Laboratory, Vol. II,* 1882–1883; *Quarterly Journal of Microscopical Science, Vol.* 21, *New Series,* 1881; *Archives de Zoologie Expérimentale, Vol. IX,* 1881.)

GEORGE FREDERIC NICOLASSEN. (1882.)
Articular Infinitive in Xenophon. (*American Journal of Philology, Vol. III,* 1882.)

HENRY BARBER NIXON. (1886.)
On Lamé's Equation.

WILLIAM ALBERT NOYES. (1882.)
The Protection from Oxidation of a Group containing two Carbon-atoms. (*American Chemical Journal, Vol. IV,* 1882–1883.)

BERNARD FRANCIS O'CONNOR. (1883.)
The Syntax of Villehardouin.

HENRY LESLIE OSBORN. (1884.)
The Gill in some Forms of Prosobranchiate Mollusca. (*Studies from the Biological Laboratory, Vol. III,* 1885.)

ALBERT GALLATIN PALMER. (1885.)
The Conduct of p-diazo-o-toluene-sulphonic Acid towards Alcohol. (*American Chemical Journal, Vol. VIII,* 1886.)

CHARLES SKEELE PALMER. (1886.)
On Benzoyl-Phenyl-Sulphamide and its Derivatives. (*American Chemical Journal, Vol. VIII,* 1886.)

CHASE PALMER. (1882.)
The Sulphocinnamic Acids. (*American Chemical Journal, Vol. IV,* 1882–1883.)

CHARLES ALBERT PERKINS. (1884.)
Variation of the Magnetic Permeability of Nickel at different Temperatures. (*American Journal of Science, Vol. XXX, Sept.,* 1885.)

BURR JAMES RAMAGE. (1886.)
Local Government and Free Schools in South Carolina. (*Studies in Historical and Political Science, Vol. I,* 1883.)

HARRY FIELDING REID. (1885.)
The Distribution of Energy in the Spectrum of Platinum at different Temperatures.

JOSIAH ROYCE. (1878.)
Interdependence of the Principles of Human Knowledge. (*Contents embodied in "Religious Aspect of Philosophy," Houghton, Mifflin & Co., Boston,* 1885.)

SHOSUKE SATO. (1886.)
History of the Land Question in the United States. (*Studies in Historical and Political Science, Vol. IV,* 1886.)

WILLIAM THOMPSON SEDGWICK. (1881.)
Influence of Quinine on the Reflex Excitability of the Spinal Cord. (*Journal of Physiology, Vol. III,* 1880; *Studies from the Biological Laboratory, Vol. II,* 1882–1883.)

HENRY SEWALL. (1879.)
Development and Regeneration of the Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Journal of Physiology, Vol. IV; Studies from the Biological Laboratory, Vol. I,* 1879–1880.)

ALBERT SHAW. (1884.)
Etienne Cabet and the Icarian Community. (*Embodied in "Icaria," Scribners, New York,* 1885.)

HENRY ALFORD SHORT. (1885.)
The Development and Use of ὡς Final. (*American Journal of Philology, Vol. IV,* 1883.)

CHRISTIAN SIHLER. (1881.)
The Formation of Bone and Tooth. (*Studies from the Biological Laboratory, Vol. II,* 1882–1883.)

ERNEST GOTTLIEB SIHLER. (1878.)
Plato's Use of Metaphor and Comparison.

EDWARD HENRY SPIEKER. (1882.)
The so-called Genitive Absolute and its Use, especially in the Attic Orators. (*American Journal of Philology, Vol. VI,* 1885.)

HENRY NEWLIN STOKES. (1884.)
The Nature of the Sulphinide obtained by Oxidizing α-Naphthalene-Sulphamide. (*American Chemical Journal, Vol. VI,* 1884–1885.)

WASHINGTON IRVING STRINGHAM. (1880.)
Regular Figures in n-Dimensional Space. (*American Journal of Mathematics, Vol. III,* 1880.)

MORRISON ISAAC SWIFT. (1885.)
The Ethics of Idealism as represented by Aristotle and Hegel.

HENRY ALFRED TODD. (1885.)
An Editio Princeps of an Old French Poem, entitled "Dit de la Panthère." (*Published in book form by the "Société des anciens textes français," Paris,* 1885.)

LEWIS WEBB WILHELM. (1884.)
Sir George Calvert, Baron of Baltimore. (*Maryland Historical Society, Fund Publications,* 1884.)

EDMUND BEECHER WILSON. (1881.)
The Origin and Significance of the Metamorphosis of Actinotrocha. (*Quarterly Journal of Microscopical Science, April,* 1881, *Vol.* 21, *New Series.*)

WOODROW WILSON. (1886.)
Congressional Government. (*Boston, Houghton, Mifflin & Co.,* 1885.)

ARTHUR YAGER. (1884.)
State and Local Taxation in Kentucky. (*Abstract in the Johns Hopkins University Circulars, No.* 32, 1884.)

B. HONORS, 1885-86.

Bachelors of Arts, 1885–86.

Thirty-one undergraduates have come forward to the Baccalaureate degree during the year, namely:—

Joseph Sweetman Ames, of Faribault, Minn.
Wilson Lloyd Bevan, of Baltimore.
Thomas Hepburn Buckler, of Baltimore.
Alfred Robert Louis Dohme, of Baltimore.
Albert Alvin Doub, of Hagerstown.
William Snyder Eichelberger, of Woodberry.
Harry English, of Washington, D. C.
Abraham Flexner, of Louisville, Ky.
William Edward Gates, of Philadelphia, Pa.
William Curns Lawrence Gorton, of Baltimore.
Joseph Edward Harry, of Pylesville.
Benjamin Henry Hartogensis, of Baltimore.
James Shaler Hodges, of Baltimore.
Theodore Hough, of Baltimore.
Percy Meredith Hughes, of Washington, D. C.
John Henry Laessig, Jr., of Baltimore.
Thomas McCabe, of Baltimore (*extra ordinem*).
Allan McLane, Jr., of Baltimore.
John Hanson Thomas McPherson, of Baltimore.
Colyer Meriwether, of Clark's Hill, S. C.
John Pleasants, of Baltimore.
Richard Hall Pleasants, Jr., of Baltimore.
William Flood Smith, of Baltimore.
Michael Daniel Stein, of Oakland, Cal.
Bernard Wiesenfeld, of Baltimore.
John Whitridge Williams, of Baltimore.
Langdon Williams, of Boston, Mass.
William Klapp Williams, of Boston, Mass.
John Randolph Winslow, of Baltimore.
Allan Chase Woods, of Baltimore.
Frederick George Young, of Beaver Dam, Wis.

Doctors of Philosophy, 1885–86.

Seventeen candidates, who had completed their courses of study, had presented the requisite theses, and had passed the examinations successfully, were made Doctors of Philosophy:—

William Shirley Bayley, of Baltimore, Md., A. B., Johns Hopkins University, 1883. *Subjects:* Geology, with Chemistry and Mineralogy. *Thesis:* Contact Metamorphism in the Slates and Sandstones of Pigeon Point, Minnesota.

Adam Todd Bruce, of New York City, A. B., Princeton College, 1881. *Subjects:* Animal Morphology, with Animal Physiology and Histology, and Psychology. *Thesis:* Observations on the Embryology of Insects and Arachnids.

Davis Rich Dewey, of Burlington, Vt., A. B., University of Vermont, 1879. *Subjects:* History and Political Economy. *Thesis:* History of American Economic Literature previous to the time of Henry C. Carey.

William Henry Emerson, of Tunnel Hill, Ga., U. S. Naval Academy, 1880. *Subjects:* Chemistry, with Physics and Mineralogy. *Thesis:* Oxidation in the Aromatic Series.

Joseph Auguste Fontaine, of Buć, France, College of Sion, Nancy, France, 1879. *Subjects:* Romance Languages and Latin. *Thesis:* History of the Use of the Auxiliaries in the Transitive, Neuter, and Reflexive Verbs of the Romance Languages.

Elgin Ralston Lovell Gould, of Washington, D. C., A. B., Victoria University (Ontario), 1881. *Subjects:* History and Political Economy. *Thesis:* Local Government in Pennsylvania.

William Penn Holcomb, of Newtown, Pa., B. L., Swarthmore College, 1878. *Subjects:* History and Political Economy. *Thesis:* Pennsylvania Boroughs.

Joseph Jastrow, of Philadelphia, Pa., A. B., University of Pennsylvania, 1882. *Subjects:* Psychology and Logic. *Thesis:* The Perception of Space by Disparate Senses.

George Theophilus Kemp, of Baltimore, Md., A. B., Johns Hopkins University, 1883. *Subjects:* Physiology and Histology, and Chemistry. *Thesis:* The so-called "New Element" of the Blood and its Relation to Coagulation.

Charles Herbert Levermore, of New Haven, Conn., A. B., Yale College, 1879. *Subjects:* History and Political Science. *Thesis:* The Republic of New Haven.

Gonzalez Lodge, of Baltimore, Md., A. B., Johns Hopkins University, 1883. *Subjects:* Greek and Latin. *Thesis:* The Participle in Euripides.

Charles William Emil Miller, of Baltimore, Md., A. B., Johns Hopkins University, 1882. *Subjects:* Greek and Latin. *Thesis:* The Participle in Pindar.

Henry Barber Nixon, of Winfall, N. C., University of North Carolina, 1878. *Subjects:* Mathematics, with Physics and Psychology. *Thesis:* On Lamé's Equation.

Charles Skeele Palmer, of Chicopee, Mass., A. B., Amherst College, 1879. *Subjects:* Chemistry, with Mineralogy and Geology. *Thesis:* On Benzoyl-Phenyl-Sulphamide and its Derivatives.

Burr James Ramage, of Newberry, S. C., A. B., Newberry College, 1880. *Subjects:* History and Political Economy. *Thesis:* Local Government and Free Schools in South Carolina.

Shosuke Sato, of Sapporo, Japan, S. B., Sapporo Agricultural College Japan, 1880. *Subjects:* History and Political Economy. *Thesis:* History of the Land Question in the United States.

Woodrow Wilson, of Wilmington, N. C., A. B., Princeton College, 1879. *Subjects:* History and Political Science. *Thesis:* Congressional Government.

Fellows, 1886–87.

Appointed by the Board of Trustees, on the nomination of the Academic Council.

Cyrus Adler, of Philadelphia, A. B., University of Pennsylvania, 1883, and A. M., 1886. *Shemitic Languages.*

Edgar Pierce Allen, of Shanghai, China, A. B., Emory College (Ga.), 1885. *Shemitic Languages.*

Louis Bell, of Baltimore, A. B., Dartmouth College, 1884. *Physics.*

John Pendleton Campbell, of Charlestown, W. Va., A. B., Johns Hopkins University, 1885. *Biology.*

Frank Albert Christie, of Boston, Mass., A. B., Amherst College, 1881. *Greek.*

Herbert Childs Elmer, of Rushford, N. Y., A. B., Cornell University, 1883. *Latin.*

Milton Haight, of Pine Orchard, Ont., A. B., University of Toronto, 1884. *Mathematics.*

John Leslie Hall, of Richmond, Va., Randolph Macon College. *Modern Languages.*

Charles Willard Hayes, of Hanover, Ohio, A. B., Oberlin College, 1883. *Chemistry.*

George Benjamin Hussey, of East Orange, N. J., A. B., Columbia College, 1884. *Greek.*

James Hervey Hyslop, of Northampton, Mass., A. B., University of Wooster, 1877, and A. M., 1880. *Philosophy.*

Andrew Cooper Lawson, of Ottawa, Canada, A. B., University of Toronto, 1883, and A. M., 1885. *Mineralogy.*

Franklin P. Mall, of Belle Plaine, Iowa, M. D., University of Michigan, 1883. *Pathology.*

Yuzero Motora, of Tokio, Japan, Doshisha Kioto, Japan, 1879. *Philosophy.*

Julius Nelson, of Waupaca, Wis., S. B., University of Wisconsin, 1881, and M. S., 1884. *Biology.*

William Ridgely Orndorff, of Baltimore, A. B., Johns Hopkins University, 1884. *Chemistry.*

Daniel Richard Randall, of Annapolis, A. B., St. John's College, 1883. *History.*

Henry Dallas Thompson, of Berkeley, Cal., A. B., Princeton College, 1885. *Mathematics.*

Edward Burr Van Vleck, Middletown, Conn., A. B., Wesleyan University, 1884. *Physics.*

Amos Griswold Warner, of Roca, Neb., B. L., University of Nebraska, 1885. *History.*

John Roaf Wightman, of Toronto, Ont., A. B., University of Toronto, 1871, and A. M., 1872. *Modern Languages.*

University Scholars, 1886–87.

University Scholarships were awarded by the Board of University Studies, to the persons named below, who had received or were about to receive the degree of Bachelor of Arts in this University.

Joseph Sweetman Ames, of Faribault, Minn., A. B., 1886.
Allan Chase Woods, of Baltimore, A. B., 1886.
Theodore Hough, of Baltimore, A. B., 1886.
Williams Curns Lawrence Gorton, of Baltimore, A. B., 1886.
Abraham Flexner, of Louisville, Ky., A. B., 1886.
Frederick George Young, of Beaver Dam, Wis., A. B., 1886.
William Flood Smith, of Baltimore, A. B., 1886.
John Hanson Thomas McPherson, of Baltimore, A. B., 1886.
William Snyder Eichelberger, of Woodberry, A. B., 1886.
Henry Van Peters Wilson, of Baltimore, A. B., 1883.
Percy Meredith Hughes, of Washington, D. C., A. B., 1886.
Harry English, of Washington, D. C., A. B., 1886.
Joseph Edward Harry, of Pylesville, A. B., 1886.
John Whitridge Williams, of Baltimore, A. B., 1886.
Wilson Lloyd Bevan, of Baltimore, A. B., 1886.
Walter Bliss Canfield, of Baltimore, A. B., 1884.

Hopkins Scholarships, 1886–87.

(Appointed by the Board of Collegiate Advisers, June 11, 1886).

HONORARY.

Appointments renewed:

Edward Carey Applegarth, of Baltimore.
Edward Lucas White, of Baltimore.
George Peter Dreyer, of Baltimore.
Raleigh Colston Gildersleeve, of Baltimore.
William Howard Miller, of Baltimore.
William Franklin Willoughby, of Virginia.
Westel Woodbury Willoughby, of Virginia.

Appointed to fill the vacancy in the scholarships for Maryland:

Julius Friedenwald, of Baltimore.

ORDINARY.

(Appointed by the Board of Collegiate Advisers).

Appointments renewed:

Hamilton McFarland Brown, of Baltimore.
Arthur Lee Browne, of Baltimore.
Charles Edward Simon, of Baltimore.
Henry Harold Ballard, of Baltimore.
William Levering Devries, of Baltimore.
Robert Milligan McLane, Jr., of Baltimore.

Appointed under the new rules.

James William Black, of Baltimore, } (of the first year).
Charles Day Lanier, of Baltimore, }

Charles Edward Coates, Jr., of Baltimore, } (of the second year).
Paul Joseph Dashiell, of Charlotte Hall, }

WASHINGTON SCHOLARS, 1886–87.

John Broughton Daish, of Washington.
John Bright Macauley, of Washington.

C. COURSES OF INSTRUCTION IN PROGRESS DURING THE ACADEMIC YEAR, 1886-87.

The number of hours of instruction given weekly are specified.

1. Mathematics: Introductory Course for Graduates: Mechanics, Higher Plane Curves, Quaternions, Finite Differences, Probabilities, Elliptic Functions, Modern Algebra, Theory of Numbers, Surfaces, Twisted Curves. 5 hrs. Through the year.
2. Quaternions. 3 hrs. Through the year.
3. Advanced Analytic Geometry. 2 hrs. Through the year.
4. Conic Sections. 2 hrs. Through the year.
5. Hydrodynamics. 3 hrs. First half-year.
6. Theory of Functions. 3 hrs. First half-year.
7. Linear Differential Equations. 2 hrs. Second half-year.
8. Abelian Functions. 2 hrs. First half-year.
9. Elasticity. 3 hrs. Second half-year.
10. Differential Invariants. 2 hrs. Second half-year.
11. Mechanics: Problems. 2 hrs. Through the year.
12. Calculus: Elementary. 3 hrs. Second half-year.
13. Advanced Algebra and Preparation for Calculus. 3 hrs. First half-year.
14. Calculus. 3 hrs. Through the year.
15. Trigonometry. 3 hrs. First half-year.
16. Analytic Geometry. 3 hrs. Second half-year.
17. Theory of Equations. 3 hrs. Through the year.
18. Mathematical Seminary: Prof. Newcomb. 1 hr. Through the year.
19. Mathematical Seminary: Dr. Story. 1 hr. Through the year.
20. Mathematical Seminary: Dr. Craig. 1 hr. Through the year.
21. Astronomy: Theoretical and Practical. 2 hrs. Through the year.
22. Electricity and Magnetism. 4 hrs. Through the year.
23. Applied Electricity. 2 hrs. Through the year.
24. Problems in Electricity. 1 hr. Through the year.
25. Physics: Major Course. 5 hrs. Through the year.
26. Physics: Elementary Mechanics, Heat, Electricity and Magnetism, Sound, Light: Minor Course. 5 hrs. Through the year.
27. Physics: Laboratory work. Daily. Through the year.

28. Chemistry of the Compounds of Carbon: Advanced lectures. 2 hrs. Through the year.
29. Stoichiometry. 2 hrs. Through the year.
30. Historical Lectures on Chemistry. 12 lectures.
31. Chemistry of the Compounds of Carbon: Major Course. 2 hrs. Through the year.
32. General Inorganic Chemistry: Lectures: Minor Course. 3 hrs. Through the year.
33. General Inorganic Chemistry: Lectures: Major Course. 2 hrs. Through the year.
34. General Inorganic Chemistry: Reviews: Minor Course. Two classes. Each 2 hrs. Through the year.
35. General Chemistry: Reviews: Major Course. 1 hr. Through the year.
36. Chemistry: Laboratory work. Daily. Through the year.

37. Mineralogy and Geology: Lectures, etc. 6 hrs. Through the year.
38. Mineralogy, Petrography, etc.: Laboratory work. Through the year.

39. Physiology: Advanced. 1 hr. Through the year.
40. Physiology: Advanced. 1 hr. Four months.
41. General Biology. 3 hrs. October to April.
42. Selected Morphological Monographs. 3 hrs. Through the year.
43. Advanced Morphology. 1 hr. Through the year.
44. Principles of Zoölogy. 1 hr. Through the year.
45. Physiology: Major Course. 3 hrs. Through the year.
46. Mammalian Anatomy. 2 hrs. October to January.
47. Osteology. 2 hrs. October to April.
48. Embryology of the Chick and Mammal. 3 hrs. April to June.
49. Plant Analysis and Systematic Botany. 2 hrs. April to June.
50. Biology: Laboratory Work. Daily. Through the year.
51. Marine Laboratory. During the Summer months.
"Journal Clubs" meet weekly in Physics, Chemistry, and Biology.

52. Pathological Histology. 3 days weekly. November to February.
53. Pathological Anatomy: Demonstrations. Weekly. Through the year.
54. Bacteriology. Daily. Two months.
55. General Pathology of Fever. Public lectures. Weekly. Three months.
56. Pathology: Laboratory work. Through the year.

57. Aristophanes: Seminary. 2 hrs. Through the year.
58. Greek Metres. 1 hr. First half-year.
59. Practical Exercises in Greek. 2 hrs. First half-year.
60. Greek Tragedians: Readings. 2 hrs. Second half-year.
61. Hermeneutics and Criticism. 1 hr. Second half-year.
62. Greek Syntax: Conferences. 1 hr. March to June.
63. Greek Comparative Grammar. 1 hr. Through the year.
64. Sophocles; Aeschylus; Survey of Greek Drama. 4 hrs. First half-year.

65. Classical Archæology. 1 hr. Through the year.
66. Sources of Classical History. 1 hr. Through the year.
67. Demosthenes; Survey of Greek Oratory. 4 hrs. Second half-year.
68. Lysias. 4 hrs. First half-year.
69. Homer: Odyssey; Euripides: Hippolytus. 4 hrs. Second half-year.
70. Greek Prose Composition. 2 classes. Each 1 hr. Through the year.
71. Greek Dialects. 1 hr. Through the year.
72. Epochs of Greek Art. Three public lectures.

73. Vergil: Seminary. 2 hrs. Through the year.
74. Macrobius. 1 hr. First half-year.
75. Latin Epic Poetry: Lectures. 1 hr. First half-year.
76. Latin Palaeography. 1 hr. Second half-year.
77. Latin Syntax: Conferences. 1 hr. Second half-year.
78. Cicero: Orator and Pro Plancio. 3 hrs. First half-year.
79. Latin: Reading at sight. 1 hr. Through the year.
80. Terence; Plautus; Survey of Roman Drama. 3 hrs. Second half-year.
81. Livy. 4 hrs. First half-year.
82. Horace: Select Odes, Satires, Epistles. 4 hrs. Second half-year.
83. Tacitus: Germania; Annales. 4 hrs. Second half-year.
84. Latin Prose Composition: 2 classes. Each 1 hr. Through the year.
85. Latin: Preparatory to Matriculation. 3 hrs. Through the year.
86. Roman Archæology. Ten public lectures.

Courses of private reading are also prescribed for students of Latin and Greek.

87. Hebrew: Elementary. 1 hr. Through the year.
88. Hebrew: Reading at sight. 2 hrs. Through the year.
89. Psalms: Critical Interpretation. 1 hr. Through the year.
90. Aramaean: Biblical Grammar and Interpretation of the Book of Daniel. 1 hr. Through the year.
91. Arabic. 1 hr. Through the year.
92. Assyrian. 2 hrs. Through the year.
93. Assyriology: Special Course. During January.
94. Babylonia and Assyria. Three public lectures.

95. Sanskrit: Elementary. 2 hrs. Through the year.
96. Sanskrit: Advanced. 2 hrs. Through the year.
97. Rig-Veda. 1 hr. First half-year.
98. Vedic Sanskrit. 1 hr. Through the year.
99. Comparative Philology. 1 hr. Through the year.

100. German: Seminary. 2 hrs. Through the year.
101. Gothic. 2 hrs. First half-year. 1 hr. Second half-year.
102. German Comparative Grammar. 2 hrs. Through the year.
103. Old Norse. 2 hrs. Second half-year.
104. Middle High German: Advanced. 2 hrs. Second half-year.
105. Middle High German: Major Course. 1 hr. Through the year.

106. Lectures on History of German Literature. 1 hr. Through the year.
107. German Syntax and Style. 1 hr., monthly. Through the year.
108. German Prose Readings. 1 hr. Through the year.
109. German Classics: Goethe, etc. 2 hrs. Through the year.
110. Lessing: Minna von Barnhelm. 1 hr. Through the year.
111. Goethe; Schiller; Lessing. 3 hrs. Through the year.
112. German Scientific Readings. 2 hrs. Through the year.
113. German Historical Readings. 2 hrs. Through the year.
114. German Prose Composition. 2 classes. 2 hrs. Through the year.
115. German Oral Practice. 1 hr. Through the year.
116. Elementary German. 5 hrs. Through the year.
117. German: Preparatory to Minor Course. 3 hrs. Through the year.
118. German Conversation. 5 hrs. Through the year.
119. Nibelungen Lied. Eight public lectures.
120. German Literature of the Nineteenth Century. Eight public lectures.

121. Romance Languages: Seminary. 2 hrs. Through the year.
122. Romance Languages: Advanced Courses. 5 classes. 6 hrs. Through the year.
123. Romance Languages: Advanced Courses. 2 classes. 2 hrs. Through the year.
124. Romance Languages: Advanced Courses (Provençal, Roumanian.) 2 classes. 2 hrs. Through the year.
125. Dante: Readings in the Divine Comedy. 1 hr. Four months.
126. Italian and Spanish. 5 hrs. Through the year.
127. Italian Literature. 1 hr. Through the year.
128. French: Major Course. 5 hrs. Through the year.
129. French: Minor Course. 5 hrs. Through the year.
130. French: Preparatory to Minor Course. 3 hrs. Through the year.
131. French: Special Course. 2 hrs. Through the year.

132. English: Seminary. Bi-weekly. Through the year.
133. Beowulf. 2 hrs. First half-year.
134. Anglo-Saxon Poetry. 2 hrs. Through the year.
135. Anglo-Saxon Prose. 1 hr. Through the year.
136. English Poets. 2 hrs. Through the year.
137. Historical English Grammar. 1 hr. Through the year.
138. Phonetics: Elements. 1 hr. Through the year.
139. Early English. 2 hrs. Through the year.
140. Anglo-Saxon Dialects. 2 hrs. Through the year.
141. Early Scottish Literature. 1 hr. Through the year.
142. English: Elizabethan Literature. 2 hrs. First half-year.
143. English: Fourteenth Century Literature. 2 hrs. Second half-year.
144. English: Eighteenth Century Literature. 1 hr. Through the year.
145. Anglo-Saxon: Elementary. 2 hrs. Through the year.
146. English Literature (P. H. E.). 2 hrs. Through the year.

147. History and Politics: Seminary. 2 hrs. Through the year.
148. Germanic Institutions. 2 hrs. Through the year.
149. Church History; Italy and Germany. 2 hrs. Through the year.
150. International Law. 2 hrs. Through the year.
151. Political Economy. 5 hrs. Through the year.
152. Finance. 3 hrs. Through the year.
153. Roman Law. 2 hrs. Through the year.
154. Historical Criticism. 1 hr. Through the year.
155. English and French History. 3 hrs. Through the year.
156. English and American Constitutions. 3 hrs. Through the year.
157. Classical Historians: Herodotus and Thucydides (in translation). 1 hr. Through the year.
158. Ante-Classic History (P. H. E.). 1 hr. First half-year.
159. Greek and Roman History (P. H. E.). 2 hrs. Through the year.
160. European History (P. H. E.). 2 hrs. Through the year.
161. Physical Geography in its relations to history (P. H. E.). 1 hr. One half-year.
162. History of Philosophy. 1 hr. Through the year.
163. Physiological Psychology. 3 hrs. Through the year.
164. Pedagogics. 1 hr. Through the year.
165. Logic, Ethics, and Psychology. 5 hrs. Through the year.
166. Elocution. Daily. Through the year.
167. Free-Hand Drawing. Daily. Through the year.
168. Mechanical Drawing. Weekly. Through the year.
169. Perspective Drawing. 3 classes. Each weekly. Through the year.
170. Personal Hygiene. Eight lectures. First half-year.

D. REPORT OF THE CHESAPEAKE ZOÖLOGICAL LABORATORY.

SESSION OF 1886.

To the President of the Johns Hopkins University:

Sir:—In accordance with your request, I submit the following report of the ninth session of the marine laboratory of the University.

During the session of 1886, the zoölogical students of the University were stationed at three widely separated points of the seacoast. A party of seven under my direction visited the Bahama Islands, two were at Beaufort, and one occupied the University table at the station of the U. S. Fish Commission at Wood's Holl.

At Beaufort, Mr. H. V. Wilson studied the development of the parasitic larvae of Cunina. The degradation of structure which is produced by a

parasitic life is one of the most interesting phenomena in the whole field of zoölogy. Parasitism is very rare among the medusae, but in the case of Cunina the larvae are often found as parasites within the bodies of other medusae, as was first discovered at Charleston, S. C., by Prof. McCrady, who found in a Turritopsis, a medusa belonging to quite a different group, parasitic larvae which he proved to be young Cuninas.

We have had many opportunities, at Beaufort, to verify McCrady's discovery, as specimens of Turritopsis with the parasitic larvae are often found there, although they have been observed nowhere else in the world except at Charleston. In the Mediterranean, Cunina larvae have been found as parasites in other Cuninas, and also on Geryonids, but none of these larvae had ever been observed on our coast, except in Turritopsis, until this summer Mr. Wilson obtained, at Beaufort, Geryonids and Cuninas with parasitic larvae as well as those in Turritopsis. He has been able to make a very thorough study of the histological and anatomical details of the process of development by which the larva becomes changed into the adult medusae, and he is now preparing for publication an illustrated account of his researches, an abstract of which is given in the University Circulars No. 54.

Mr. Haldeman studied at Beaufort the metamorphosis of the Tornaria larva of Balanoglossus, as the observations which were made there two years ago by Mr. Bateson upon the development of a species which has no Tornaria stage has thrown new light upon the vexed question of the affinities of these animals and has rendered a complete history of the Tornaria larva peculiarly desirable. Mr. Haldeman has this summer traced the metamorphosis of the Tornaria into the young Balanoglossus, and he has also preserved a good supply of specimens of the various stages and he is now engaged in studying by sections the minute details of the process of development. An abstract of some of the results of his work is given in the University Circulars, No. 54.

Dr. Bruce studied at Wood's Holl the early stages in the development of the Squid and the origin of the blastoderm, and he has proved that all the cells of the body, those of the endoderm as well as those of the other germ layers, are directly derived from the blastoderm, by ordinary cell division. An illustrated account of his work is now in preparation.

The party which visited the Bahamas consisted of seven persons, and our expedition occupied two months, about half of this being consumed by the journey.

The season which is most suitable for our work ends in July, and we had hoped to reach the Islands in time for ten or twelve weeks of work there, but the difficulty which I experienced in my attempts to obtain a proper vessel delayed us in Baltimore, and as we met with many delays after we started, we were nearly three weeks in reaching our destination.

We stopped at Beaufort to ship our laboratory outfit and furniture, but the vessel, a schooner of 49 tons, was so small that all the available space was needed for our accommodation, and we were forced to leave part of our outfit behind at Beaufort.

We reached our destination, Green Turtle Key, on June 2d, and remained there until July 1st. The fauna proved to be so rich and varied and so easily accessible that we were able to do good work, notwithstanding the shortness of our stay and the very primitive character of our laboratory. This was a small dwelling house which we rented. It was not very well adapted for our purposes, and we occupied as lodgings the rooms which we used as work rooms.

One of the most interesting results of our season was the capture of two very young Cubo-medusae, a group regarding the life history of which nothing whatever was previously known. The specimens, which are probably the young of Cheiropsalamus, were at two stages of development. Careful drawings of them were made while they were alive, and they were then hardened and preserved for more complete examination, and an illustrated account of them will soon be ready for publication.

My own desire to visit the tropics this summer was due to the hope that I might be able to procure the eggs of some Stomatopod and to trace their development by actual observation, for notwithstanding the fact that the adults are distributed all over the world, and are abundant on all shores of the tropical and sub-tropical ocean, nothing whatever has ever been learned regarding their early stages by actual observation, although we have in the one hundred or more larval types which have been described, abundant material for tracing out whatever can be learned from this source of indirect evidence.

As the adults do not, like other Crustacea, carry their eggs about with them, attached to their bodies, but deposit them at the bottom of their deep and inaccessible burrows, it is almost useless to attempt to procure them in the case of any of our common species; but as it has long been known that many species live in the limestone of coral reefs, where the hardness of the material prevents them from burrowing very deeply, I hoped that, by visiting a coral island, I might be able to obtain their eggs. This hopé was completely gratified, for I not only procured an abundant supply of the eggs of Gonodactylus cheiragra at all stages, but I also hatched hundreds of larvae from the eggs and reared them through several moults.

Soon after our arrival at Green Turtle Key, Mr. Andrews, while breaking a water-worn fragment of coral rock, found a specimen of Gonodactylus hidden in a fissure, and with it a mass of eggs which were clearly those of some Crustacean. These eggs were shown to me late in the afternoon, and as the tide was out I went at once to a spot near the laboratory where the beach is covered with fragments from an overhanging cliff. In the water I found a large honey-combed fragment and dashed it against a larger rock to break it. It was nearly dark but light enough to enable me to see several specimens of Gonodactylus creeping out of the broken fragments and swimming away, and the large rock which I had used as an anvil was spattered with yellow eggs which I gathered up as well as I could in the darkness. A few days later some of these eggs hatched into the first Stomatopods which had ever been reared in captivity. I procured a good series of

drawings of the various stages of development, as well as a supply of preserved material which I am now engaged in studying.

Mr. Herrick, who has been at work for the last eighteen months on the embryology of Alpheus, procured at Green Turtle Key the eggs and young of several species, and his abstract, stating the most important results of his work, is given in the University Circulars, No. 54.

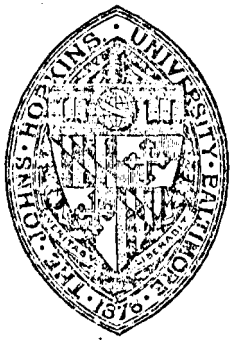
A review, in detail, of the work of this laboratory is also given in the University Circulars, No. 54, and there may also be found a list of researches—statements of the results of which have been published.

Respectfully,

W. K. BROOKS,
Director of the Marine Laboratory.

BALTIMORE, December, 1886.

E. SEAL OF THE JOHNS HOPKINS UNIVERSITY.



By the formal action of the Board of Trustees, Dec. 7, 1885, an official seal (of which the above diagram is a fac-simile) was adopted, and at a subsequent meeting, April 5, 1886, the following regulations were prescribed by the same authority, with respect to the guardianship of the seal and its use.

"*Resolved*, That the fac-simile of the seal may be printed upon the official reports and registers and other papers proceeding from the Trustees, upon the journals which receive financial support from the University, upon literary and scientific publications proceeding from the University which have received the approbation of the Academic Council, and upon a book-plate to be inserted in books belonging to the University library; and that the use of the fac-simile without the authority of the Trustees be forbidden."

In the preparation of the design the authorities were particularly indebted to Stephen Tucker, Esq., of London, Somerset Herald, who revised and

arranged the suggestions transmitted to him from Baltimore by Clayton C. Hall, Esq., to whom the University also owes its grateful acknowledgments for many kind services.

In the design for the seal symbols of learning have been placed in combination with the well-known Arms of Maryland. The arms of the State are those of Lord Baltimore's family which became a part of the Great Seal of Maryland at an early period in the history of the colony.

The emblems adopted to symbolize the University are open books and a terrestrial globe—indicative of literary and scientific studies. These have been placed upon an azure background and occupy the upper portion of the shield, above the name of the State. There is thus presented (in the words of the Somerset Herald), "an heraldic picture of a University situated in the State founded by Lord Baltimore."

The motto of the University VERITAS VOS LIBERABIT (which has been in use since its organization) is taken from the Gospel of St. John viii. 32. The shield is hung from a bough of oak. The legend upon the border gives the corporate name and place of the foundation, and the date when instructions were begun, viz.: THE JOHNS HOPKINS UNIVERSITY, BALTIMORE, 1876.

GREAT SEAL OF MARYLAND.

The following account of the Great Seal of Maryland has been prepared by the librarian of the University, Dr. Wm. Hand Browne, editor of the Maryland Archives.

The design of the present Great Seal of Maryland was devised by Cecilius, the first Proprietary, in 1649, to replace an earlier seal which had disappeared in what is called "Ingle's rebellion" in 1644. The differences from the first seal were probably introduced as a safeguard against a fraudulent use of the latter, in case it happened to be in bad hands. The commission which accompanied the new seal, contains a minute description of the devices on both sides.

On one side this seal bore the effigy of Baltimore himself in full armor, on horseback, surrounded by the legend—"CAECILIUS ABSOLUTUS DOMINUS TERRÆ MARIÆ ET AVALONIÆ BARO DE BALTIMORE." This part of the seal was *personal*, and liable, of course, to change with each Proprietary.

On the other side it bore the Calvert arms, heraldically described as "paly of six, or and sable, a bend dexter counterchanged," quartered with the Crossland arms, which Baltimore derived from his grandmother, Alicia Crossland, and which are blazoned, "quarterly, argent and gules, a cross flory counterchanged."

On the shield was placed a Palatine's cap, or coronet, signifying the Palatinate jurisdiction of the Proprietary, and above this a helmet bearing the Calvert crest, a ducal crown with two half bannerets, one gold, the other black.

The Calvert supporters were two leopards; but for the Maryland seal Baltimore adopted a farmer and fisherman as emblems of the chief industries

of the Province. On a scroll beneath was the motto of the family, "FATTI MASCHII PAROLE FEMINE;" and around the whole ran a legend taken from the fifth Psalm: "SCUTO BONÆ VOLUNTATIS TUÆ CORONASTI NOS."

All this part of the seal was *dynastic*, representing the Proprietary government; and when the State took the government into her own hands, she retained the beautiful and significant historical symbol as the emblem of her sovereignty.

F. THE DEATH OF PROFESSOR MORRIS.

Professor CHARLES D'URBAN MORRIS, Collegiate Professor of Latin and Greek in the Johns Hopkins University, died at his residence in Baltimore, February 7, 1886, after an illness of nearly ten days.

He was a son of Rear-Admiral Henry Gage Morris, of the British Navy, who came of a Yorkshire family, was born in New York in 1770, and married in 1807 a daughter of the Rev. F. Orpen, a clergyman of the English Church in the County of Cork. Professor Morris, who was one of a family of ten children, was born in Charmouth, Dorset, England, February 17, 1827. He received his collegiate training in the University of Oxford. As a student of Lincoln College he was admitted to the degree of Bachelor of Arts in 1849. His name appears in the first class of those who received honors *in literis humanioribus*. Three years later he became a Master of Arts and a Fellow of Oriel College. He came to this country in 1853, and was for a time Rector of Trinity School in the city of New York, and subsequently Master of a private school for boys at Lake Mohegan, near Peekskill. He was then made a Professor in the University of the City of New York, and from that position he was called in 1876 to the chair in the Johns Hopkins University which he held until his death.

He was the author of a Latin Grammar and Reader, and of an Attic Greek Grammar, in which some original views of the proper methods of teaching the elements of the Latin and Greek languages were carefully unfolded; and he wrote a number of articles on philological topics, most of them contributed to the American Journal of Philology and to the American Philological Association. At the time of his death he was nearly ready to publish an edition of the First Book of Thucydides, with notes, the final sheets of which will be carried through the press by his associates.

His powers, however, were chiefly devoted to the work of instruction, and he never appeared to greater advantage than when surrounded by his pupils in the class-room or in his parlor, or when he took part in the admission of undergraduate students and in the presentation of candidates for the baccalaureate degree. His enthusiasm, his sympathy, his honesty and his Christian faith were apparent under all circumstances; and there was a personal charm in that mixture of confidence and diffidence which he so often manifested—confidence in the domain with which he was familiar, diffidence with respect to duties which he was not accustomed to perform. The University will long lament his death.

The body of Mr. Morris was buried in St. Paul's Churchyard (corner of Fremont and German streets) on Wednesday, February 10. The funeral services, conducted by Rev. Dr. J. S. B. Hodges, the Rector, were held in St. Paul's Church. The officers and students of the University accompanied the family as mourners from the dwelling-house to the church.

The resolutions which were adopted after Mr. Morris's death, and a list of his writings, are given in the American Journal of Philology, Vol. vii, No. 1.

A tablet placed in Hopkins Hall by his pupils bears the following inscription: —

AETERNAE · MEMORIAE ·
CAROLI : DVRBANI : MORRIS : M · A ·
COLLEGII · ORIELENSIS · OXON · OLIM · SOCII ·
IN · HAC · ACADEMIA ·
PER · X · ANNOS ·
LITTERARVM · LATINARVM · GRAECARVMQVE ·
PROFESSORIS ·
QVI · OBIIT · SEXAGENARIVS · FERE ·
VII · DIE · FEBRVARII · A · D · MDCCCLXXXVI ·
HOC · DESIDERII · PIETATISQVE ·
MONVMENTVM ·
DISCIPVLI · MAERENTES ·
F · C ·

G. THE DEATH OF PROFESSOR RABILLON.

Professor Léonce Rabillon, Lecturer on French Literature, died at Cape May, N. J., August 11, in the seventy-second year of his age. He was a native of France and a graduate of the University of France, where he received the degree of Bachelier ès Lettres, in 1832, and of Licencié en Droit in 1836. He had been a resident of Baltimore and a teacher of the French, Spanish, and Italian languages for many years, and he had held the position of Lecturer on French Literature in the University since its opening.

Among his published works may be mentioned a metrical translation into English of the Chanson de Roland, and a translation into French of Nathaniel Hawthorne's Wonder Book.

At a meeting of the Board of Trustees of the University, October 4, 1886, the following minute was adopted:

Resolved, That this Board has heard, with great regret, of the death of Professor Léonce Rabillon, lately connected with the Academic Staff of this University, and desires to record among its minutes its sense of the many excellencies of the deceased as a scholar and a Christian gentleman.

H. APPOINTMENTS DURING THE YEAR.

The position vacated by the death of Professor Morris was filled by the election of Professor John H. Wright, M. A., of Dartmouth College, to be Professor of Classical Philology. At the same time the office of Dean of the College Board was instituted by the action of the Trustees, and Professor Wright was appointed to that position. He entered upon his duties in September, 1886, and at the opening of the academic year gave an address on "The College in the University and Classical Philology in the College," which has been printed.

Mr. G. H. Emmott, M. A., of the University of Cambridge, and lately a lecturer in Owens College, has been appointed Associate Professor of Logic and Ethics and Lecturer on Roman Law.

The persons below named have been appointed Associates in the branches named:

Louis Duncan, Ph. D., *Electricity and Magnetism.*
Edward Renouf, Ph. D., *Chemistry.*
Edward H. Spieker, Ph. D., *Latin and Greek.*

I. GIFTS TO THE LIBRARY FROM SEPTEMBER 1, 1885, TO SEPTEMBER 1, 1886.

ALLAN, W. (Author). Life of John McDonogh. Baltimore. O.
BAKER, A. L. (Compiler). Decisions of Courts of Pennsylvania. Phila., 1885–6. 2 vols. O.
BALFOUR FAMILY. Works of F. M. Balfour. Memorial Ed., London, 1885. 4 vols. Q.
BALL, V. (Author). Manual of the Geology of India. Vol. 3. Calcutta, 1881. Q.
BARNEY, MRS. C (Author). The Grimké Sisters. Berlin, 1885. D.
BINION, S. A., M. D. Van Swieten, Commentary on Boerhaave. 5 vols. Q.
BOWIE, A. J (Author) Hydraulic Mining in California. New York, 1885. Q.
BRITISH GOVERNMENT. "Challenger" Reports: Zoölogy. London, 1886. 3 vols. Q.
BROWNING, O. (Editor). Dispatches of Earl Gower. Cambridge, 1885. O.
BUCHERER, A. Justiniani Institutiones. Amstelodami, 1627. S.
CHILTON, E. B. Aristophanes. Plutus, ed. H. P. Cookesley. London, 1834.
Aristotle. Selections from the Nicomachean Ethics, ed. Wm. Fitzgerald.
Book of Psalms, tr. T. K. Cheyne.
Buchholz, E. Anthologie aus den Lyrikern der Griechen. Leipzig, 1875.
Cambridge Greek Testament: Luke, ed. F. W. Farrar. Cambridge, 1884.
Caspari, C. B. Grammatica Arabica. Lipsiae, 1848.
Cherbonneau. Histoire de Chems Eddine et de Nour Eddine. Paris, 1869.
Curtius, G. Erläuterungen zu meiner griechischen Schulgrammatik. Prag, 1876.
Curtius. Die griechischen Münzen. Berlin, 1869. O.
Die letzten Zeiten von Granada, ed. M. J. Müller. München, 1863.
Die neue Weltordnung. H. Brugsch. Berlin, 1881.
Davis, N. and B. Davidson. Arabic and Syriac Reading Lessons. 2 vols. London.
Delitzsch, Fr. Wo lag das Paradies? Leipsic, 1881.
Hebrew Language viewed in the light of Assyrian Research. London, 1883.
Dieterici, Fr. Arabisch-Deutsches Handwörterbuch zum Koran. Leipzig, 1881.
Ewald, H. Hebräische Sprache des alten Bundes. Göttingen, 1870.
Sprachwissenschäftliche Abhandlungen. I. Göttingen, 1861.
Genesis. The Hebrew Text after Van der Hooght. London.
Haupt, P. Der Keilinschriftliche Sintfluthbericht. Leipzig, 1881.

CHILTON, E. B. Haupt, P. Beiträge zur Assyrischen Lautlehre. Göttingen, 1883.
Sumerische Studien. Leipzig, 1879.
Das Babylonische Nimrod-Epos. Leipzig, 1884.
Hensell, W. Griechisches Verbal-Verzeichniss. Prag, 1881.
Hiob. Erklärt v. L. Hirzel. Leipzig, 1852.
Hommel, F. Semitischen Völkersprachen. Leipzig, 1883.
Hovelacque, A. Science of Language. London, 1877.
Job. The Hebrew Text after Van der Hooght. London.
Jonah in Four Semitic Versions. W. Wright. London, 1857.
Journal Asiatique, 1880-86. 7 vols. Paris.
Lenormant, Fr. Les Origines de l'Histoire. Paris, 1880.
Liber Genesis, ed. S. Baer. Lipsiae, 1869.
Lotz, W. Die Inschriften Tiglath Pilesers I. Leipzig, 1880.
Luzzato, S. D. Grammar of Biblical Chaldaic.
Mani, seine Lehre and seine Schriften, ed. G. Flügel. Leipzig, 1862.
Newton, R. H. The Book of the Beginnings. New York, 1884.
Petermann, J. H. Brevis linguae Arabicae Grammatica. Carlsruhe, 1867.
Philosophie and Theologie v. Averroes. M. J. Müller. München, 1875.
Reuss, Ed. Geschichte der Heiligen Schriften alten Testaments. Braunschweig, 1881.
Revue de l'histoire des Religions, 1880-81. Paris.
Selden, John. De Diis Syris Syntagmata. Lipsiae, 1672.
Theologisch Tidschrift, 1880-85. 6 vols. Paris.
Wailly, N. de. Joinville et les enseignements de St. Louis. Paris, 1872.
Wolff, M. El Senusis Begriffsentwicklung. Leipzig, 1848.
Zeitschrift d. deutschen morgenländischen Gesellschaft. Bd. 24.
Zeitschrift fur die Alttestamentliche Wissenschaft. Giessen, 1881.
CHISOLM, J. J., M. D. Dictionnaire de Médecine et de Chirurgie. Paris, 1829. 15 vols. O.
CLERCQ, L. DE (Author). Antiquités Assyriennes. Paris, 1885. 3 vols. F.
COOK, G. H. Whitfield, Brachiopoda and Lamellibranchiata of N. J. Trenton, 1886. Q.
COWLEY, C. (Author). Leaves from a Lawyer's Life. Lowell, 1879. D.
DALL, C. H. (Author). What we Know about Shakespeare. Boston, 1886. D.
DEWITT, A. Brydges. Censura Literaria. London, 1815. 10 vols. O.
Cokain. Dramatic Works. Edinburgh, 1874. O.
Crowne. Dramatic Works. Edinburgh, 1873. 2 vols. O.
Davenant. Dramatic Works. Edinburgh, 1873. O.
Democratic Review. Washington and New York, 1838–42. 10 vols. O.
The Federalist. (Reprint). Morrisania, 1864. Q.
Sabine. Loyalists of American Revolution. Boston, 1864. 2 vols. O.
Sidney. Discourses on Government. New York, 1865. 3 vols. O.
Van Schaack. Life of P. Van Schaack. New York, 1842. O.
Wilson. Dramatic Works. Edinburgh, 1874. O.
DEPEYSTER, GEN. J. W. Collection of historical and critical papers.
DINGLE, E. (Author). Balance of Physics. London, 1885. O.
DORSEY, REV. J. O. (Author). Omaha Sociology. Washington, 1885. Q.
DWIGHT, H. E. (Author). Life of E. G. Booth. Philadelphia, 1886. O.
ELY, R. T. Hadley. Railroad Transportation. New York, 1885. D.
EVANS, F. W. Shaker and Shakeress' Monthly. New York, v. d. 3 vols. F.
FROTHINGHAM, A. L. Chronology of Portraits of Popes, &c. 3 vols., with plates.
GEOLOGICAL SURVEY OF INDIA. A large collection of the Memoirs of the Survey, including the Palaeontologia Indica. Calcutta, v. d. Q.
GIBSON, A. M. (Author). A Political Crime. New York, 1886. D.
GILMAN, PREST. D. C. Brush. Manual of Mineralogy. New York, 1875. O.
Harris. Entomological Correspondence. Boston, 1869. O.
Review of Principal Nations of Europe. London, 1770. 2 vols. O.
Scammon. Marine Mammals of North-west Coast. San Francisco, 1874. Q.
Stanley. Addresses and Sermons. New York, 1879. O.
Thompson. Memoir of D. Hale. New York, 1850. O.
Collection of maps, public documents and pamphlets.

GORMAN, HON. A. T. Poore. List of Government Publications. Washington, 1885. Q.
GREEN, HON. S. A. Sibley. Sketches of Harvard Graduates. Cambridge, 1881. O.
HALL, PROF. G. S. (Author). Pedagogical Library. I. Boston, 1885. D.
HALSTED, G. B. (Author). Elements of Geometry. New York, 1885. O.
HERMITE, CH. (Author). Mathematical memoirs and papers. V. p., v. d. Q and O.
HERRICK, C. L. (Author). Outlines of Psychology. Minneapolis, 1886. . D.
HOLT, H. & Co. (Publishers). Bacourt. Letters from America. New York, 1885. D.
Goethe's Poems, tr. by W. Gibson. New York, 1886. D.
Maine. Popular Government. New York, 1886. O.
Percival. Roumanian Fairy Tales. New York, 1885. D.
Shakespeare's Works. New York, 1886. 7 vols. D.
Sumner. Protectionism. New York, 1885. D.
Zeller. History of Greek Philosophy. New York, 1886. D.
Twelve other volumes of their recent publications.
HOWARD, G. E. Transactions Nebraska Historical Society. I. Lincoln, 1885. O.
HUDSON, J. F. (Author). Railways of the Republic. New York, 1886. O.
INGHAM, W. A. Reports and Maps of Second Geological Survey of Pa. Harrisburg.
LAESSIG, J. H. Licetus De Monstrorum Natura. Patavii, 1634. O.
LANGDON, REV. C. W. Collection of scientific papers. V. p, v. d.
MARTIN, PROF. H. N. Archiv für die Physiologie. Halle, 1796-1815. 10 vols. O.
MCELHAN, J. J. Collections of U. S. documents.
RATH, G. VOM. (Author). Papers on Mineralogy. V. p., v. d. O and Q.
ROHÉ, G. H. (Author). Text-book of Hygiene. Baltimore, 1885. O.
ROYAL OBSERVATORY OF EDINBURGH. Smyth. Micrometrical Measures of Gaseous Spectra. Edinburgh, 1886. Q.
SCHIMPER, A. F. W. (Author). Die Chlorophyllkörper. Berlin, 1885. O.
SZOLD, REV. B. The Book of Job. Hebrew Text and Commentary. Baltimore, 1886. O.
TICKNOR, MISS A. E. (From the collection of the late George Ticknor).
Barbier, A. A. Dictionnaire des ouvrages anonymes, &c. Paris, 1827. 4 vols. O.
Bredow, C. G. Weltgeschichte in Tabellen. Altona, 1816. F.
Brüggemann, L. W. English Editions of Greek and Latin Authors. Stettin, 1797. O.
Brydges, E. The British Bibliographer. London, 1810. 4 vols. O.
Ebert, F. A. Allgem. Bibliograph. Lexicon. Leipzig, 1821. 24 vols. Q.
Edwards, E. View of the principal Public Libraries. London, 1849. F.
Flögel, C. F. Geschichte der Komischen Literatur. Leipzig, 1784. 4 vols. O.
Göttingische Gelehrte Anzeigen. Göttingen, 1817-21. 15 vols. D.
Griffiths, A. F. Bibliotheca Anglo-Poetica. London, 1815. Q.
Jöcher, C. G. Allgem. Gelehrten Lexicon. Leipzig, 1750. 10 vols. Q.
Kruse, C. Atlas der Geschichte. Leipzig, 1816. F.
Lowndes, W. T. Bibliographer's Manual. 1st ed. London, 1834. 4 vols. O.
Manne, L. C. J. de. Recueil d'ouvrages anonymes, &c. Paris, 1854. O.
Martin, H. Catalogue of Books Privately Printed. London, 1834. O.
Mensel, J. G. Das Gelehrte Deutschland. Lemgo, 1796-1821. 18 vols. D.
Sulzer, J. G. Allgem. Theorie der Schönen Künste. Leipzig, 1792. 4 vols. O.
Wakefield, G. Silva Critica. Cambridge, 1789. 2 vols. O.
Watt, R. Bibliotheca Britannica. Edinburgh, 1824. 4 vols. Q.
TILLINGHAST, C. B. Massachusetts public documents. 40 vols.
TUSKA, REV. S. W. (Author). The Stranger in the Synagogue. Rochester, 1854. S.
Graetz. Influence of Judaism on the Reformation. Cincinnati, 1867. O.
UNIVERSITY OF MINNESOTA. Geology of Minnesota. Minneapolis, 1884. Q.
UNIVERSITY OF VIRGINIA. Jefferson. Essay on Anglo-Saxon. New York, 1851. Q.
VIRGINIA HISTORICAL SOCIETY. Brock. Documents relating to the Huguenot Emigration to Virginia. Richmond, 1886. O.
WILLIAMS, R. L. Bankers' Magazine. New York, 1854-77. 22 vols. O.
WILLIAMS, R. S. Hist. de l'Acad. Royale d'Inscriptions. Hague, 1724-80. 16 vols. D.

Also, from various official sources, U. S. Reports and other Government Publications; Publications of the Smithsonian Institution; Official documents of various States and Cities.

K. LIST OF CORRESPONDENTS.

During the past year the Publication Agency of the Johns Hopkins University has received the scientific and literary publications of the institutions named below. A full list of the periodicals on file in the University Library may be found in the University Circulars.

GERMANY AND AUSTRIA.

Berlin: Deutsche chemische gesellschaft.
K. Preuss. akademie der wissenschaften.
Bonn: Verein von alterthumsfreunden.
Cassel: Verein für naturkunde.
Cracow: Académie des sciences.
Dresden: Naturwissenschaftliche gesellschaft Isis.
Emden: Gesellschaft für bildende kunst.
Erlangen: Seminarium philologicum.
Physikal-medicinische societät.
Frankfort a. M.: Senckenbergische naturforschende gesellschaft.
Frankfort a. O.: Naturwissenschaftlicher verein.
Freiburg i. B.: Naturforschende gesellschaft.
Göttingen: K. gesellschaft der wissenschaften.
Halle: K. Leop.-Carolin. akademie.
Hamburg: Naturhistorisches museum.
Mathematische gesellschaft.
Wissenschaftliche anstalten.
Hanover: Historischer verein für Niedersachsen.
Heidelberg: Naturhistor-medicinischer verein.
University.
Hermannstadt: Verein für naturwissenschaften.
Innsbruck: Institut für Oesterreich. geschichtsforschung.
Kiel: University.
Observatory.
Konigsberg: Physikal-oekonom. gesellschaft.
Leipsic: Astronomische gesellschaft.
K. Sächsische gesellschaft der wissenschaften.
Mainz: Mittel-rheinische fabrikanten-verein.
Marburg: Gesellschaft zur beförderung der gesammten naturwissenschaften.
Munich: Gesellschaft für anthropologie, ethnologie, etc.
K. Bayerische akademie der wissenschaften.
Görres-gesellschaft.
Prague: Fednota ceských mathematiků.
K. Böhmische gesellschaft der wissenschaften.
Society of Bohemian philologists; *Philological and paedogogical journal.*
Verein für geschichte der Deutschen in Böhmen.
Stuttgart: Verein für vaterländisch-naturkunde.
Trieste: Museo civico di storia naturale.
Vienna: Gesellschaft für bildende künste.
Oesterreichische museum für den Orient.
K. k. akademie der wissenschaften.
K. k. geologische reichsanstalt.
K. k. naturhistorisches hofmuseum.
K. k. Oest. museum für kunst und industrie.
Ornithologischer verein.
Zool. inst. der universität.

Wiesbaden: Nassauische verein für naturkunde.
Würzburg: Medicinische facultät.
Zool.-zootomische institut.

France and Switzerland.

Avranches: Société d'archéologie.
Berne: Schweiz. gesellsch. für d. gesammten wissenschaften.
Caen: Académie des sciences, arts et belles-lettres.
Société des pharmaciens du Calvados.
Cherbourg: Société nationale des sciences nat. et math.
Lille: Société géologique du nord.
Paris: Institut de France: académie des sciences.
Association française pour l'avancement des sciences.
Assoc. pour l'encouragement des études grecques.
Bureau des longitudes.
École centrale des arts et manufactures.
École des chartes.
École libre des sciences politiques.
École normale supérieure.
École polytechnique.
Faculté des sciences à la Sorbonne.
Ligue française de l'enseignment.
Ministère de l'instruction publique.
Observatoire.
Société chimique.
Société d'economie sociale.
Société de l'enseignement supérieur.
Société de l'histoire du protestantisme française.
Société de legislation comparée.
Société de linguistique.
Société française d'archéologie.
Société Française de botanique.
Société historique et cercle St. Simon.
Société mathématique de France.
Société nationale d'antiquaires de France.
Romans (Drôme): Société d'histoire et d'archéologie de Valence.
Roscoff: Laboratoire d. zoologie expérimentale.
Toulouse: Académie des sciences.
Zurich: Société helvétique des sciences naturelles.

Belgium and Holland.

Amsterdam: Royal academy of sciences.
Royal zoölogical society.
Antwerp: Académie d'archéologie de Belgique.
Brussels: R. académie des sciences de Belgique.
Musée royale d'histoire naturelle.
Société royale malacologique de Belgique.
Observatoire royale.
Delft: École polytechnique.
Harlem: Musée Teyler.
Société Hollandaise des sciences.
Leyden: Nederland. dierkundige verein.
Liège: Société royale des sciences.

Italy.

Bologna: R. deputazione di storia patria.
Società medica-chirurgica.
Brescia: Ateneo di Brescia.
Como: Società storica per la provincia di Como.
Florence: Società entomologica Italiana.
Museo Italiano di antichità classica.
Genoa: Società di letture.
Milan: Istituto Lombardo di scienze e lettere.
R. accademia di belle arti.
Modena: Société des naturalistes.
Naples: R. academia delle scienze fisiche e. mathematiche.
Società di storia patria.
Zoölogical station.
Padua: Società Veneto-trentina di scienze naturali.
Palermo: Circolo matematico.
Società Siciliana per la storia patria.
Rome: Commissione archeologica comunale.
Imperiale istituto archeologico Germanico.
R. accademia dei Lincei.
R. comitato geologico d'Italia.
Accad. pontificia dei nuovi Lincei.
Department of foreign affairs.
Società geografica Italiana.
Società Romana di storia patria.
Turin: Museo di zoologia ed anatomia comparata.
Observatoire della università.
R accademia delle scienze.
Venice: R. Istituto Veneto.
R. deputazione Veneto s. g. s. di storia patria.

Spain and Portugal.

Barcelona: Associació d'excursions Catalana.
Coimbra: Sociedade broteriana.
Lisbon: Academia real das sciencias.
Sociedade da geografia.
Madrid: R. academia de la historia.
R. academia de ciencias.
Observatorio astronomico.
San Fernando: Instituto y observatorio de marina.

Denmark, Sweden and Norway.

Bergen: Museum.
Christiania: University.
Commission der gradmessung.
Société des sciences.
Copenhagen: Royal academy of sciences.
Stockholm: Hogskola.
Geologiska forening.
Physiologische laboratorium.
K. Svenska vetenskaps akademie.
K. historische antiquitets akademie.

Russia and Finland.

Charkow: Mathematical society.
Dorpat: Naturforscher gesellschaft.

Helsingfors: Societa scientiarum fennica.
Kasan: Physical-mathematical society.
Moscow: Société impériale des naturalistes.
Odessa: Royal imperial university.
Mathematical society.
Natural history society.
Riga: Naturforschen. verein.
St. Petersburg: Académie impériale des sciences.
Russian archæological society.
Russian chemical society.

Great Britain and Ireland.

Birmingham: Philosophical society.
Cambridge: Antiquarian society.
Philological society.
Philosophical society.
University reporter.
Dublin: Royal Dublin society.
Royal Irish academy.
University press.
Edinburg: Royal physical society.
Royal society.
Scottish geographical society.
Glasgow: Philosophical society.
Observatory of the university.
Greenwich: Royal observatory.
London: Chemical society.
Conchological society.
Crystallogical society.
Geological society.
Institute of actuaries.
Mathematical society.
Mineralogical society of Great Britain and Ireland.
Palestine exploration fund.
Philological society.
Royal archæological institute.
Royal astronomical society.
Royal historical society.
Royal institution.
Royal microscopical society.
Royal society.
Science and art department (South Kensington).
Society of antiquaries.
Society of biblical archæology.
Society of chemical industry.
Society of telegraph engineers.
Statistical society.
Manchester: Literary and philosophical society.
Oxford: Historical society.
University gazette.

British East Indian Possessions.

Calcutta: Asiatic society of Bengal.
Geological survey of India.
Colombo, Ceylon: Ceylon branch of royal Asiatic society.
Singapore: Straits branch of the royal Asiatic society.

AFRICA.

Bone, Algeria: Académie d'Hippone.
Oran, Algeria: Société de géographie et d'archéologie.

JAPAN.

Tokio: Rômaji kai.
Seismological society of Japan.
Society for the advancement of medical science in Japan.
University: science department.
Yokohoma: Asiatic society of Japan.

AUSTRALIA AND NEW ZEALAND.

Adelaide: Royal society of South Australia.
Sydney: Linnean society.
Royal society of New South Wales.
Wellington: New Zealand institute.
Colonial museum.
Geological survey.

MEXICO, WEST INDIES, AND SOUTH AMERICA.

Cordoba (Arg. Rep.): Academia nacional de ciencias.
Mexico: Observatorio del Mexico.
Sociedad cientifica.
Quito: Universidad de Quito.
Port au Prince, Haiti: Société de science et geographie.
Rio de Janeiro: Museo nacional.
Observatoire impériale.

DOMINION OF CANADA.

Hamilton: Hamilton association.
Halifax: Institute of natural science.
Montreal: Royal society of Canada.
Natural history society.
Ottawa: Geological and natural history survey.
Toronto: Canadian institute.

GREECE AND TURKEY.

Athens: Deutsch. archäolog. institut.
École Française d'archéologie.
Constantinople: Hellenikos philologikos syllogos.

UNITED STATES.

American association for the advancement of science.
American historical association.
American institute of mining engineers.
American medical association.
American oriental society.
American philological association.
American social science association.
Archæological institute of America.
Association of engineering societies.
Albany: N. Y. state museum of natural history.
Annapolis: U. S. naval institute.
Baltimore: Maryland historical society.
Medical and chirurgical faculty of Md.
Peabody institute.
Bethlehem, Pa.: Engineering society of Lehigh university.

Brookville, Ind.: Society of natural science.
Boston: American academy of arts and sciences.
Mass. historical society.
National association of wool manufacturers.
New England historic-genealogical society.
Public library.
Society of natural history.
Zoölogical society.
Buffalo: American society of microscopists.
Historical society.
Brooklyn: Long Island historical society.
Cambridge, (Mass.): Harvard college observatory.
Harvard college library.
Museum of comparative zoölogy.
Chicago: Academy of sciences.
Cincinnati: Mechanics' institute.
Observatory.
Public library.
Society of natural history.
Concord: New Hampshire historical society.
Davenport (Iowa): Academy of natural sciences.
Denver: Colorado museum of geology, etc.
Scientific society.
Granville (O.): Denison university scientific laboratory.
Iowa City: Iowa state historical society.
Ithaca (N. Y.): Cornell university library.
Lincoln (Neb.): Nebraska historical society.
Lowell (Mass.): Historical association.
Madison (Wis.): Washburn observatory.
Wisconsin historical society.
Minneapolis: Minnesota academy of natural sciences.
New Haven: Connecticut academy of arts and sciences.
Newark: New Jersey historical society.
Newport (R. I.): Natural history society.
New York: Academy of sciences.
American chemical society.
American geographical society.
American institute of mining engineers.
American museum of natural history.
Columbia college, school of mines.
Linnæan society.
Microscopical society.
Military service institution.
Normal (Ill.): Illinois state laboratory of natural history.
Philadelphia: Academy of natural sciences.
American philosophical society.
College of physicians.
Franklin institute.
Library company.
Mercantile library.
Penna. historical society.
University of Pa., Wharton school.
Portland: Maine historical society.
Poughkeepsie, N. Y.: Vassar brothers institute.
Princeton (N. J): Museum of geology and archæology.
Providence: Rhode Island historical society.
Public library.
Raleigh: North Carolina agricultural experiment station.

Richmond: Southern historical society.
Virginia historical society.
Salem (Mass.): Essex institute.
Peabody academy of sciences.
San Francisco: California academy of sciences.
Technical society of the Pacific Coast.
Savannah: Georgia historical society.
Scranton (Pa.): Lackawanna institute.
Sedalia (Mo.): Natural history society.
St. Louis: Academy of sciences.
St. Paul: Minnesota historical society.
Minnesota natural history and geological survey.
Topeka: Kansas state historical society.
Washburn college laboratory.
Trenton (N. J.): Natural history society.
Troy (N. Y): Rensselaer society of engineers.
Washington: Army medical museum.
Astronomical observatory.
Biological society.
Bureau of ethnology.
Coast and geodetic survey.
Corps of engineers.
Fish commission.
Geological survey.
Naval museum of hygiene.
National academy of sciences.
National museum.
Naval medical society.
Patent office.
Philosophical society.
Signal service.
Smithsonian institution.
Other government publications.
Worcester: American antiquarian society.

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Issued, January 20, 1887.

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