Borst, Charles A.

D. C. Gilman correspondence

~~1945~~
1-4-45

Ms. 1

Borst

Johns Hopkins University,

Baltimore, Oct. 11 1890

President Gilman,

Dear Sir:

I beg by signify my acceptance of the appointment designated in your letter of the 10th instant.

Respectfully Yours,

C. A. Borst

L. A. Borst

accepts

assistant

Oct. 14/90

JOHNS HOPKINS UNIVERSITY.
Baltimore, Md.
Please return, if not called for in ten days.

[encl-5]

C. A. Borgen

Astronomy

Papers filed with
me, Jan. 5. 1891
respecting the Borgen
right to the title
of Professor,
etc

D. C. G.

[1/5/91]

1890.

Seventy-Eighth Commencement
OF HAMILTON COLLEGE.

Sunday, June 22.

11.00 A. M.—BACCALAUREATE SERMON before the Class of 1890, in the Stone Church in Clinton,

By President HENRY DARLING, D. D., LL. D.

7.30 P. M.—Anniversary Exercises of the Young Men's Christian Association of Hamilton College, in the Stone Church, with the Annual Address,

By Trustee HORACE BRINSMAID SILLIMAN, A. M., Cohoes.

Monday, June 23.

7.30 P. M.—McKINNEY PRIZE DECLAMATION in the Stone Church.

CLASS OF 1891.

O. M. ABERNATHY,..Leavenworth, Kas.	GEORGE H. FELTUS,.....Auburn.
THOMAS L. COVENTRY,.....Deerfield.	F. B. HATHAWAY,.....Rochelle, Ill.
GEORGE VAIL EDWARDS,...Riverhead.	BRADLEY SHEPPARD,.....Penn Yan.

CLASS OF 1892.

THOMAS W. CHESTER,.....College Hill.	STROTHER W. RICE,.....Syracuse.
JOHN B. HOOKER, Jr.,.....Fly Creek.	HENRY S. VERRILL,.....Franklin.

FREDERICK W. WELSH, Binghamton.

CLASS OF 1893.

DANIEL W. BURKE,.....Oxford.	CHARLES E. ORSLER,.....Auburn.
NATHANIEL McGIFFIN, ...Fairhaven.	ALEXANDER WOUTERS,..So. Hammond.

Music by GARTLAND'S TENTH REGIMENT ORCHESTRA.

Tuesday, June 24.

8.00 A. M.—Entrance Examinations in the West Room of the Chapel. In Greek, from 8.00 A. M. to 10.00 A. M. In English, from 10.00 A. M. to 11.00 A. M. In Mathematics, from 11.00 A. M. to 1.00 P. M. In Latin, from 3.00 P. M. to 5.00 P. M.*

2.00 P. M.—Annual Meeting of the Board of Trustees, in the Chapel of the Stone Church.

2.30 P. M.—"Campus Day" Exercises on College Hill.

President,.....SAMUEL DUNCAN MILLER, Washington, D. C.
Orator,.....ROBERT JAMES HUGHES, Remsen.
Poet,.....WILLIAM DAY CROCKET, Sterling.
Response for the Class of 1891,.....DUNCAN CAMPBELL LEE, Franklinville.
Response for the Class of 1892,.....CHARLES ANDREW FRASURE, Sherburne.
Response for the Class of 1893,.....DANIEL WYETTE BURKE, Oxford.
Executive Commiitee,.....GEORGE HENRY MINOR, Deposit.
MELVIN GILBERT DODGE, East Rodman,
JAMES BURTON, ALBANY.

Music by GARTLAND'S TENTH REGIMENT ORCHESTRA.

*Candidates admitted June 24, either by certificate or by examination, may present themselves as competitors for the BROCKWAY ENTRANCE PRIZE at the examinations to be held September 16 and 17.

7.30 P. M.—McKINNEY PRIZE DEBATE in the Stone Church.

Question.—"Should the State Teach Religion?"

Disputants.

LINCOLN A. GROAT,.....Franklin.	WALSTEIN ROOT.....College Hill.
GEORGE A. MINOR,.....Deposit.	DELOS DEW. SMYTH,.....Clinton.
M. N. POPOFF,.....Bansko, Macedonia.	EDWARD L. STEVENS,.....Malone.

Music by GARTLAND'S TENTH REGIMENT ORCHESTRA.

10.15 P. M.—Reception of the Class of 1890, in Scollard Opera House.

Reception Committee,.....{ ALFRED AUSTIN MOORE, College Hill.
EDWARD NORTH SMITH, Watertown.
EDDY CLARK COVELL, Cazenovia.

Wednesday, June 25.

9.30 A. M.—Game of Base Ball between the nine of Alumni and the Undergraduate Nine, on the College Hill Ball Ground.

10.00 A. M.—Adjourned Meeting of the Board of Trustees, in the Chapel of the Stone Church.

11.45 A. M.—Annual Meeting of the Society of Hamilton Alumni, in the Stone Church, HANNIBAL SMITH, '66, President. Election of Officers for 1890–91.

12.00 M.—Election of a Trustee of the College to succeed EDWARD NORTH, whose term expires June 26, 1890. Polls close at 1.00 P. M. Reading of Half-Century Letter by Rev. HENRY KENDALL, D. D., New York City, (Class of 1840.)

1.50 P. M.—Reunion of the Class of 1840—Rev. Dr. HENRY KENDALL, New York, *Secretary*. Reunion of the Class of 1850—Dr. DAVID H. COCHRAN, Brooklyn, *Secretary*. Reunion of the Class of 1860—Editor MILTON H. NORTHRUP, Syracuse, *Secretary*. Reunion of the Class of 1865, at the Clinton Grammar School, HAMILTON B. TOMPKINS, New York City, *Secretary*. Reunion of the Class of 1870—Rev. Prof. HENRY A. FRINK, Amherst College, *Secretary*. Reunion of the Class of 1880—ROBERT J. KNOX, St. Paul, Minn., *Secretary*. Reunion of the Class of 1887—Principal ARTHUR M. SEEKELL, Union Springs, *Secretary*.

3.30 P. M.—"Class Day" Memorial Exercises in the Stone Church.

President,.....EUGENE LANDON CONKLIN, Southold.
Orator,.....ROBERT BENEDICT PERINE, Lysander.
Poet,.....JAMES AUSTIN TOOLEY, Clifford.
Prophet,.....JOSEPH DARLING IBBOTSON, JR., Richfield Springs.
Historian,.....CLAYTON HALSEY SHARP, Seneca Falls.
Permanent Secretary,.....WILLIAM MORGAN PHILLIPS, Pulaski City, Va.

Presentation Committee,.....{ JAMES ARTHUR SEAVEY, Saratoga Springs.
CHARLES HERBERT ANTHONY, Gouverneur.
FRED HEERMANCE MEAD, Halcott.

7.30 P. M.—Seventy-Eighth Annual Oration before the Society of Hamilton Alumni, in the Stone Church, by **Dr. SELDEN HAINES TALCOTT, Ph. D.**, Middletown, (Class of 1869). Annual Poem, by **Professor CLINTON SCOLLARD, A. M.**, Clinton.

Music by GARTLAND'S TENTH REGIMENT ORCHESTRA.

Thursday June 26.

9.30 A. M.—Commencement Exercises in the Stone Church.

1.30 P. M.—Presentation of Prizes and Conferring of Degrees.

2.00 P. M.—Reunion of Alumni and Invited Guests in Scollard Hall.

8.00 P. M.—President DARLING's Reception on College Hill.

CLASS OF 1890.

CHARLES HERBERT ANTHONY, ... Gouverneur.
JAMES ROBEET BENTON, ... Clinton.
JAMES BURTON, ... Albany.
EUGENE LANDON CONKLIN, ... Southold.
EDDY CLARK COVELL, ... Cazenovia.
WILLIAM DAY CROCKETT, ... Sterling.
MELVIN GILBERT DODGE, ... East Rodman.
EMORY LEROY EVANS, ... North Walton.
HYMEN AUGUSTUS EVANS, ... North Walton.
CLARENCE JAMES GEER, ... Seneca Falls.
FRANK GIBBONS, ... Franklin.
CHARLES OLIVER GRAY, ... Ogdensburg.
LINCOLN ABRAHAM GROAT, ... Franklin.
ROBERT JAMES HUGHES, ... Remsen.
JOSEPH DARLING IBBOTSON, Jr., ... Richfield Springs.
HARRY DAY KITTINGER, ... Lockport.
WILLIAM ULRIC KREUTZER, ... Lyons.
CALVIN LESLIE LEWIS, ... Deposit.
WILLIAM RANSFORD LOOMIS, ... Norwich.
ROSCOE BELDEN MARTINDALE, ... Herkimer.
FRED HEERMANCE MEAD, ... Halcott.
SAMUEL DUNCAN MILLER, ... Indianapolis, Ind.
GEORGE HENRY MINOR, ... Deposit.
ALFRED AUSTIN MOORE, ... College Hill.
ROBERT BENEDICT PERINE, ... Lysander.
WILLIAM MORGAN PHILLIPS, ... Pulaski City, Va.
MARCO NIKOLA POPOFF, ... Bansko, Macedonia.
ALBERT HUSTED RODGERS, ... Albany.
WALSTEIN ROOT, ... College Hill.
JAMES ARTHUR SEAVEY, ... Saratoga.
CLAYTON HALSEY SHARP, ... Seneca Falls.
EDWARD NORTH SMITH, ... Watertown.
DELOS DE WOLF SMYTH, ... Clinton.
EDWARD LAWRENCE STEVENS, ... Malone.
PAUL THEODOROFF, ... Garvanova, S. Bulgaria.
JAMES AUSTIN TOOLEY, ... Clifford.

OBITUARY RECORD FOR 1889-90.

HENRY ALLEN FOSTER, (Chairman of Trustees,) æt. 89.

Son of TIMOTHY FOSTER. Born in Hartford, Conn., May 7, 1800. Removed with his father to Utica, N. Y., in 1803, and to Madison County in 1807. Began the study of law in 1815, with DAVID B. JOHNSON, of Cazenovia. Admitted to the bar in 1822, and began the practice of law in Rome. Appointed Surrogate of Oneida County in 1827, by Governor DEWITT CLINTON. State Senator from fifth district, 1831-34. In 1834 re-appointed Surrogate of Oneida County by Governor MARCY. President of the Bank of Rome, 1832-40. Member of Twenty-Fifth Congress, 1837-38. State Senator and President of Court for the Correction of Errors, 1841-44. United States Senator in 1844 by appointment of Governor BOUCK. Justice of State Supreme Court, fifth district, 1864-71. Received LL. D. from Hamilton College in 1860. Trustee of Hamilton College, 1836-89, and Chairman of the Board since 1880 Died in Rome, N. Y., May 11, 1889. His surviving daughters are Mrs. D. L. BOARDMAN, of Troy, and Mrs. G. H. LYNCH, of Rome.

WILLIAM DEXTER WALCOTT, (Trustee, 1863–90,) æt. 77.

Eldest son of BENJAMIN S. WALCOTT. Born at New York Mills, July 29, 1813. Married Miss HANNAH COE HUBBARD, of Middlefield, Conn., September 12, 1837. In 1860, he united with his father in endowing "The Walcott Professorship of the Evidences of Christianity" in Hamilton College. Died at New York Mills, April 1, 1890. His wife and six children survive.

JAMES BOYLAN SHAW, (Trustee, 1877–90,) æt. 82.

Was born in the city of New York, of Scotch ancestry, August 25, 1808. United with the Brick Church in New York, of which Rev. Dr. GARDNER SPRING was pastor, in 1828. Graduated from Auburn Seminary in 1832. Ordained and installed at Attica, July 2, 1835. Pastor of Brick Church in Rochester, 1840-77. Received D. D. from Rochester University in 1852. Moderator of General Assembly in 1865. Trustee of Auburn Seminary, 1858-90. Married Miss EMILY E. CHASE, Auburn, August 15, 1832. Married Miss LAURA J. RUMSEY, of Silver Creek, May 24, 1845. Died in Rochester, May 8, 1890.

Class of 1817.

CHARLES SETON HENRY, æt. 65.

Son of ROBERT R. HENRY and ISABELLA [SETON] HENRY. Born in Albany, N. Y., in November, 1799. Admitted to the bar in Albany, N. Y., in 1820, and removed soon to Savannah, Ga. Presiding Justice of the Supreme Court of Chatham County, Ga., 1838-46. Several times a member of the General Assembly of Georgia. His death, (not before reported,) occurred in Savannah, Ga., in August, 1864.

Class of 1822.

WILLIAM JOHNSON BACON, æt. 86.

Son of Hon. EZEKIEL BACON, and grandson of Hon. JOHN BACON. Born in Williamstown, Mass., February 18, 1803. Admitted to the bar in 1824. Editor of the Utica *Sentinel and Gazette*, 1824-6. Law partner of Hon. CHARLES P. KIRKLAND, '16, 1832-51. Member of New York Legislature, 1850. Judge of New York Supreme Court, Fifth District, 1853-70. Received LL. D. from Hamilton College in 1854. Trustee of Hamilton College, 1856-89. President of Utica Savings Bank, 1873-89. President of Forest Hill Cemetery, 1874-89. Member of 45th Congress, 1877-79. Author of "Memorial of WILLIAM KIRKLAND BACON," '63, his only son, who was fatally wounded in the battle of Fredericksburgh, Dec. 13, 1862. Married, (1) Miss ELIZA KIRKLAND, (daughter of Hon. JOSEPH KIRKLAND, of Utica,) who died in 1872. Married (2) in October, 1874, Mrs. SUSAN SLOAN GILLETTE, who survives. Judge BACON died in Utica, July 3, 1889. His only surviving daughter is Mrs. CORNELIA G. CRITTENDEN, of Utica.

Class of 1822, (Union College.)

JAMES ROBERT BOYD, æt. 85.

Son of ROBERT and MARY SCOTT BOYD. Born in Windham, N. Y., May 2, 1804. Graduated from Princeton Theological Seminary in 1826. Pastor Second Presbyterian Church in Watertown, 1832-33. Principal of Jefferson County Institute, 1836-48. Trustee

of Hamilton College, 1847-49. Professor of Moral Philosophy in Hamilton College, 1849-50. Author of "Principles of Rhetoric," "Life of Doddridge," "The Communion Table," "Bible Method of Daily Living." Received D. D. from Hamilton College in 1871. Married Miss ELIZABETH CAMP, of Sacketts Harbor, in 1832. Died at Geneva, N. Y., February 19, 1890. Of his two surviving daughters, one is the wife of JAMES B. HYDE, of Greenbush Heights, N. Y., the other is the wife of Chief Justice JUDD, of Honolulu, S. I.

Class of 1828.

JOHN FLAVEL BROOKS, æt. 87.

Born in Westmoreland, N. Y., December 3, 1801. Graduated from Yale Divinity School in 1831. Ordained at Utica, N. Y., in September, 1831. Home Missionary in St. Clair County, Ill., 1831-2. Teacher in Belleville, Ill., and Waverly, Ill., 1832-40. Teacher in Springfield, Ill., from 1840 onwards. Died in Springfield, Ill., July 23, 1888.

Class of 1834.

THOMAS THAXTER BRADFORD, æt. 80.

Son of LEVI BRADFORD and MERCY [SAMPSON] BRADFORD. Born in Plympton, Mass., June 26, 1809. United with the Congregational Church in Homer, N. Y., September 4, 1831. Graduated from Auburn Theological Seminary in 1837. Tutor in Hamilton College, 1837-45. Ordained at Gilbertsville, January 12, 1848. Preached at Gilbertsville, 1846-50; at Birmingham, Pa., 1851-53; at Waterford, Pa., 1853-70. Resided in Metuchen, N. J., 1870-89. Married Miss MARY ELIZA PADDOCK, of Clinton, N. Y., May 19, 1846. Died in Metuchen, N. J., June 3, 1889. His wife survives.

WILLIAM CURTIS HOLGATE, æt. 74.

Son of CURTIS and ALVIRA PRENTICE HOLGATE. Born in Burlington, Vt., November 23, 1814. Prepared for college at the Utica Academy. Admitted to the bar of the Supreme Court of Ohio in 1838. In 1839, appointed prosecuting attorney for Williams County, Ohio. President of Defiance Savings Bank and Merchants' National Bank of Defiance. Director of Baltimore and Ohio R. R. Co. Married, January 5, 1850, Miss MARY HOELRICH, who died June 6, 1865. Mr. HOLGATE died at Defiance, O., August 13, 1888. His daughter, Mrs. FANNIE MAUD HOLGATE, wife of C. PERRY HARLEY, of Defiance, O., survives.

Class of 1835.

BENJAMIN WOODBRIDGE DWIGHT, æt. 74.

Son of Dr. BENJAMIN WOOLSEY DWIGHT and SOPHIA [WOODBRIDGE] DWIGHT. Born in New Haven, Conn., April 5, 1816. Graduated from Yale College Divinity School in 1838. Tutor in Hamilton College, 1839-42. Founder First Presbyterian Church in Joliet, Ill., in 1844. Principal of High School in Brooklyn, 1846-58; of High School in Clinton, 1858-63; of High School in New York City, 1863-67. Author of "Higher Christian Education," "Modern Philology," "Woman's Higher Culture," "The True Doctrine of Divine Providence," "History of the Strong Family," and "History of the Dwight Family." Received Ph. D. from University of the City of New York in 1862. Married, July 29, 1846, WEALTHY JANE DEWEY, of Forestville, N. Y., who died August 23, 1864. Married, December 22, 1865, CHARLOTTE SOPHIA PARISH, who survives. Dr. DWIGHT died in Clinton, September 18, 1889. The surviving children are SOPHIA E. DWIGHT, of Clinton; Mrs. ISABELLA J. [DWIGHT] SMITH, wife of Prof. CHARLES SPRAGUE SMITH, of Columbia College; and BERTHA W. DWIGHT, of Smith College.

Class of 1839.

LORING FOWLER, æt. 73.

Son of DANIEL and SALLY WARD FOWLER. Born in Peterboro, N. Y., August 11, 1815. Admitted to the bar in Cooperstown, August 11, 1846. Practiced law from 1847 in Canastota, N. Y., where he served at various times, as justice of the peace, town clerk, supervisor, school commissioner, and village president. County Clerk of Madison County, 1862-65. Member of Constitutional Convention from Madison-Oswego District, 1867-68. Married ANN JENNETTE CURTIS, daughter of JOHN G. CURTIS, of Peterboro, August 11, 1840. Mr. FOWLER died May 9, 1888, leaving three daughters and one son: Mrs. ALGENIA KNOX WARNER, Mrs. FLORENCE A. ANDERSON, and Mrs. MAUDE G. EDGERTON, of Canastota, and JOHN CURTIS FOWLER, '69, of Syracuse.

Class of 1842.

NORTON ASA HALBERT, æt. 71.

Son of ASA HALBERT and LOUISA [GILLETT] HALBERT. Born in Westmoreland, N. Y., December 21, 1818. Practiced law, first in Buffalo, and afterwards in New York City. Died in Middlebury, Conn., January 4, 1890, and was buried in Westmoreland, beside his wife and only son.

Class of 1843.

WARD WESLEY HUNT, æt. 73.

Son of WILLIAM HUNT and BETSEY CAULKINS HUNT, one of ten children. Born in Westmoreland, N. Y., February 9, 1817. Received on trial in 1848, and ordained as an elder June 27, 1852, by Bishop MORRIS, of the Black River Conference. Fulfilled annual appointments in this Conference from 1848 to 1882. Commissioned as Chaplain of 98th N. Y. Vols. in 1865. Was twice married, (1) to CLARISSA SMITH, of Adams, N. Y., May 20, 1845, who died October 16, 1848; (2) to ELIZABETH A. SMITH, of Adams, N. Y., July 9, 1850, who died April 14, 1888. Mr. HUNT died in Adams, N. Y., September 7, 1889. Two children survive: FANNIE E. HUNT and EDWARD S. HUNT.

Class of 1850.

WARREN WILLIAM WARNER, æt. 64.

Born in Vernon, N. Y., November 9, 1824. United with the Congregational Church in Oberlin, O., in 1841. Graduated from Auburn Theological Seminary in 1853. Ordained by the Black River Association, January 20, 1858. Preached in Congregational Churches in New Haven, N. Y., Belleville, Ill., Dodgeville, Wis., Sacketts Harbor, Champion, Paris Hill, Lebanon, Lawrenceville, South Canton, Norfolk, Raymondville, Port Leyden, Coventryville. Married, in 1858, Miss ANNA GATES LEWIS, of Chicago, Ill., who survives, with one daughter. Mr. WARNER died, of pneumonia, at Clifton Springs, N. Y., April 15, 1889.

Class of 1854.

ANDREW SHUMAN, æt. 60.

Son of JACOB and MARY [WHISTLER] SHUMAN. Born in Lancaster, Pa., November 8, 1830. Prepared for college at the Clinton Liberal Institute. Editor of Syracuse *Daily Journal*, 1853-56. Married in 1855, Miss LUCY B. DUNLAP, of Ovid, N. Y. Editor of Chicago *Evening Journal*, 1856-88. President of *Evening Journal* Co., 1878-90. State Penitentiary Commissioner for Illinois, 1856-71. President of Evanston Board of Education, 1875. Author of "The Loves of a Lawyer," published in 1875. Lieutenant Governor of Illinois, 1877-81. Presidential Elector for Illinois, 1881. Died of apoplexy, in Chicago, May 5, 1890. His wife survives; also his married daughter, Mrs. FRANK ELLIOTT, of Evanston, Ill.

Class of 1855.

JOHN FRANCIS KENDALL, æt. 57.

Son of JOHN KENDALL and brother of Rev. Dr. HENRY KENDALL, '40. Born in Volney, N. Y., March 4, 1832. United with East Bloomfield Church in May, 1850. Graduated from Auburn Theological Seminary in 1859. Ordained and installed at Baldwinsville, August 31, 1859. Pastor at Baldwinsville, 1859-68; at Columbus, O., 1868-71; at La Porte, Ind., 1871-89. Married JULIA C. BIRDSEY, of Pompey, N. Y., September 6, 1859. Received D. D. from Wabash College in 1873. Died of apoplexy, at Baldwinsville, N. Y., August 10, 1889.

SCHUYLER BLISS STEERS, æt. 57.

Son of IRA STEERS and LUCY [BLISS] STEERS. Born in Hartwick, N. Y., August 4, 1832. Married, May 20, 1857, CATHARINE ELIZABETH CLARKE, youngest daughter of Rev. Dr. TERTIUS S. CLARKE. Was a teacher in Virginia; a bookseller in Racine, Wis.; a cotton broker in Columbus, Miss., and a manufacturer of cotton presses in New Orleans, La. Died at "Lakelands," Cooperstown, December 6, 1889. Bequeathed $10,000 to Hamilton College to endow the "Schuyler B. Steers Scholarship." His wife and three children died before him.

Class of 1856.

CHARLES WEST CLISBEE, æt. 56.

Son of LEWIS and HANNAH CLISBEE. Born in Cleveland, O., July 24, 1833. Admitted to the bar of Michigan in 1858. Presidential elector from Michigan in 1860. Colonel 112th Michigan Vols. Michigan State Senator, 1866-67. Reading Clerk in six Congresses, 1869-83. Judge of Michigan Circuit Court, 1877-79. Clerk of Republican National Conventions of 1880, '84, '88. Mayor of Cassopolis. Married, April 13, 1858, ANNA B. HAYDEN, of North Adams, Mass. Died Sunday evening, August 18, 1889. Mrs. CLISBEE survives, with two daughters, BELLE CLISBEE and MAUD CLISBEE. An only son, CHARLES W. CLISBEE, Jr., died August 20, 1884.

Class of 1858.

GEORGE ROOT SLACK, æt. 48.

Born in Mexico, N. Y., November 26, 1831. Prepared for college at Mexico Academy. Married, November 14, 1856, Mrs. MARY COAN BURDEN, who died December 9, 1875. Mr. SLACK died in Mexico, of pneumonia, April 22, 1879. (His death not before reported.) An only daughter is living in St. Paul, Minn.

HENRY CLAY HOWE, æt. 57.

Son of AMORY and MARY HOWE. Born in Granby, N. Y., August 23, 1832. Prepared for college at Falley Seminary and Seneca Falls Academy. Studied law with JAMES H. TOWNSEND, '50, of Fulton. Supervisor of Volney in 1866, '67, '69 and '70. Chairman of Oswego County Supervisors in 1869 and '70. Member of Assembly for the first district of Oswego in 1885, '86 and '87. Married, in 1860, LETITIA CROMBIE, of Fulton, who died in 1879. Married, in 1881, MAY NORTHRUP, of Oswego Falls, who survives her husband. Mr. HOWE died, of paresis, at Fulton, July 28, 1889. His children are LILLIAN C. HOWE and HERBERT C. HOWE, by his first wife; and HARRY N. HOWE, by his second wife.

Class of 1863.

GEORGE MILTON LOOMIS, æt. 52.

Son of Dr. EDWARD LOOMIS, of Oneida, N. Y. Born in Westmoreland, N. Y., March 7, 1838. Prepared for college at Whitestown Seminary. In 1861, enlisted in 3d N. Y. Vols., and was severely wounded at Big Bethel, June 10, 1861. Graduated from St. Louis Medical College in 1865, and located as a practicing physician and surgeon at Easton, Mo. Suffered a stroke of paralysis in August, 1881, and died at Easton, June 27, 1889. Was married in March, 1867, to MAGGIE E. FORBES, who died in February, 1871. Was married in January, 1872, to FRANCES E. SCOVILLE, who survives. Five daughters also survive.

Class of 1866.

JONATHAN FISHER CROSSETTE, æt. 45.

Son of Rev. ROBERT CROSSETTE. Born in Alstead, N. H., October 1, 1844. Graduated from Lane Theological Seminary in 1869. Ordained by Presbytery of Cincinnati in September, 1870. Married, May 4, 1870, Miss MARY MERRILL, of Pembroke, N. H. Missionary of Presbyterian Board of Foreign Missions at Chefoo, North China, 1870-79. While acting as an independant American Missionary in China, Mr. CROSSETTE died, June 21, 1889, on board the steamer "El Dorado," between Shanghai and Tientsin. Buried in the European Cemetery of Tientsin. Mrs. CROSSETTE survives.

Class of 1867.

MARTIN FOSTER HOLLISTER, æt. 52.

Born in Danby, N. Y., October 6, 1837. Graduated from Union Theological Seminary in 1870. Married, March 22, 1870, Miss AMANDA BOGARDUS, of Danby, N. Y. Ordained by Presbytery of Newark, June 3, 1870. Pastor of 6th Presbyterian Church of Newark, N. J., 1870-84. District Secretary of American Tract Society in Chicago, Ill., 1885. Treasurer of Chicago Theological Seminary, 1885-89. Died, of consumption, at Enfield Centre, N. Y., July 31, 1889. His wife and two sons survive, with their home in Ithaca, N. Y.

Class of 1868.

EBEN WINSLOW JUDSON, æt. 45.

Son of General R. W. JUDSON. Born in Ogdensburg, N. Y., February 21, 1845. Prepared for college at the Rural High School in Clinton. Graduated from the Albany Law School in 1866. Practiced law in St. Joseph, Mo., 1866-90. Married Miss EMILIE CARPENTER, of Providence, R. I., November 5, 1868. President of St. Joseph Board of Trade, 1885-86. At his death was President of the St. Joseph, St. Louis and Santa Fe Railway; also President of St. Joseph Terminal Company; also aid-de-camp on the staff of Governor DAVID R. FRANCIS. Died of paralysis of the brain, at St. Joseph, Mo., April 7, 1890, leaving a widow and four children.

Class of 1870.

CHARLES JONAS EVERETT, æt. 42.

Only son of MATTHEW J. EVERETT and JEANNETTE EVERETT. Born in Litchfield, Herkimer County, February 9, 1848. Prepared for college in the Utica Academy. Studied law with Hon. ROSCOE CONKLING in Utica, and admitted to the bar in 1871. Practiced law in the firm of Dennison, Knox & Everett, 1871-80. Deputy Attorney General of New York State, under Attorney General HAMILTON WARD, 1879-81. Attorney for Receivers of the Universal Life Insurance Company, 1882-88. Formed law partnership with WILLIAM E. LEWIS in 1882. Died at 50 Rutger Street, Utica, January 19, 1890. Mr. EVERETT was never married.

Class of 1886.

GEORGE WASHINGTON GIBBY, æt. 30.

Born in Freedom, Cattaraugus County, N. Y., January 18, 1860. Prepared for college at Ten Broeck Academy, Franklinville. Left college at the end of Freshman year. Principal of Ellicottville Union School, 1882-89. Married, September 1, 1886, Miss CORA B. PERSING, of Portville, N. Y. Died at Portville, March 24, 1890. His wife survives, with one daughter.

Trustees of Hamilton College.

		Elected.
*Hon.	HENRY A. FOSTER, LL. D., Rome,	1836
*Hon.	WILLIAM J. BACON, LL. D., Utica,	1856
	*WILLIAM D. WALCOTT, Esq., New York Mills,	1863
	CHARLES C. KINGSLEY, A. M., Utica,	1867
Rev.	L. MERRILL MILLER, D. D., Ogdensburg,	1869
	PUBLIUS V. ROGERS, A. M., Utica,	1869
Gen.	SAMUEL S. ELLSWORTH, A. M., Penn Yan,	1870
Rev.	HENRY KENDALL, D. D., New York,	1871
	GILBERT MOLLISON, Esq., Oswego,	1871
Hon.	ELLIS H. ROBERTS, LL. D., Utica,	1872
Hon.	DANIEL P. WOOD, A. M., Syracuse,	1874
Hon.	GEORGE M. DIVEN, A. M., Elmira,	1874
Hon.	THEODORE W. DWIGHT, LL. D., New York,	1875
Hon.	JOSEPH R. HAWLEY, LL. D., Hartford, Conn.,	1875
Pres.	DAVID H. COCHRAN, Ph. D., LL. D., Brooklyn,	1875
Rev.	JAMES B. LEE, D. D., Bovina,	1877
*Rev.	JAMES B. SHAW, D. D., Rochester,	1877
Pres.	HENRY DARLING, D. D., LL. D., Clinton,	1880
Prof.	EDWARD NORTH, L. H. D., LL. D., Clinton,	1881
Hon.	ELIHU ROOT, A. M., New York,	1883
Hon.	JOHN JAY KNOX, A. M., New York,	1884
	CHARLES A. HAWLEY, A. M., Seneca Falls,	1884
Rev.	THOMAS B. HUDSON, D. D., Clinton,	1884
	HORACE B. SILLIMAN, A. M., Cohoes,	1885
	A. NORTON BROCKWAY, A. M., M. D., New York,	1885
Rev.	T. RALSTON SMITH, D. D., Buffalo,	1886
Rev.	GEORGE B. SPALDING, D. D., Syracuse,	1886
Hon.	THEODORE M. POMEROY, A. M., Auburn,	1886

Rev.	THOMAS B. HUDSON, D. D., *Secretary.* (1885,) *and Treasurer,*	1886
Prof.	CHARLES A. BORST, A. M., *Assistant to the Treasurer*	1881

* Deceased.

New York Central Railroad.—Trains Leave Utica as follows:

Going East.		Going West.	
Accommodation to Albany,	8.22 A. M.	New York and Pacific Express,	5.07 A. M.
North Shore Express,	9.37 A. M.	Little Falls Accommodation,	7.26 A. M.
Special New York Express,	11.20 A. M.	Accommodation,	10.55 A. M.
New York Express,	12.01 P. M.	Day Express,	11.40 A. M.
New York and Chicago Limited,	1.42 P. M.	Accommodation,	1.55 P. M.
Accommodation,	2.25 P. M.	New York and Chicago Limited,	3.35 P. M.
Day Express,	4.20 P. M.	Rochester Express,	4.05 P. M.
Little Falls Accommodation,	6.15 P. M.	Chicago Express,	5.45 P. M.
Chicago Express,	11.00 P. M.	Little Falls and Oneida Accom	6.15 P. M.
St. Louis Express,	11.57 P. M.	New York and Syracuse Accom	8.35 P. M.

New York, West Shore and Buffalo Railway.—Trains leave Utica.

Going East.		Going West.	
West Shore Express,	11.46 A. M.	Chicago Express,	12.32 A. M.
New York Express,	4.01 P. M.	Canajoharie Local,	8.26 A. M.
Canajoharie Local,	6.06 P. M.	Buffalo Express,	12.02 P. M.
Atlantic Express,	12.08 A. M.	Chicago Express,	5.29 P. M.

New York, Ontario and Western Railroad.

Trains Leave Utica.—8.15 A. M.; 1.00 P. M.; 4.38 P. M.; ***7.00** P. M.; 10.52 P. M.

Leave Clinton.—8.10 A. M.; 11.37 A. M.; 1.45 P. M.; 5.03 P. M.; 6.15 P. M.; ***10.15** P. M.

Leave Rome for Clinton.—6.50 A. M.; 4.00 P. M.

Leave Clinton for Rome.—11.40 A. M.; 6.20 P. M.

*Special trains on Monday, Tuesday and Wednesday.

Alumni and strangers, on arriving in Clinton, are requested to register their names at the office of Elliott S. Williams, near to the Post Office.

[1/5/91]

[From *Utica Herald*, November 28th, 1889.]

THE STAR CATALOG.

Letter From Dr. Simon Newcomb—An Astronomer's Views of an Interesting Case.

To the Editor of the Utica Morning Herald

In view of the interest which many people feel in the great "star catalog case," of Peters vs. Borst, I hope it will not be out of place if an astronomer makes known his views on Judge Williams' recent decision. Being myself an employing astronomer, if the expression can be applied to one who has corps of assistants working under his orders, it may naturally be supposed that I am biased in favor of the plaintiff. I shall, however, try to be as fair as I can to both parties.

Had the case been left to arbitration by astronomers, as I at one time hoped it might be, the first question before them would have been whether the defendant had done the work in the line of his official duty as assistant in the observatory, or on his own account as a young astronomer desiring to gain a reputation. This question is settled for us by the opening part of the recent decision of your court. Here it is pointed out that work produced by the plaintiff as an author can not belong to the college, and the same suggestion is said to be applicable to the defendant. I think all astronomers will agree with the judge that the preparation of the catalog in dispute was no part of the official duty of either plaintiff or defendant, and would found this conclusion not only on the gound laid down by the judge, but on the additional fact that the instruments of the observatory were not necessary to the work. It might have been done in the Astor library, and as a matter of fact, was done in great part outside the Litchfield observatory. Such being the case, the relations of the parties as to this work were the same as if defendant had not been connected with the observatory at all.

Now the great facts of the case, as shown in the evidence, are these:

1. All the manuscripts in dispute were, with trivial exceptions, the handiwork of defendant and his two sisters, they having bought the paper, done the figuring, and copied the results. About half the manuscript contained, here and there, slight emendations by plaintiff, and the other half he had never even seen.

2. The sisters had devoted two or three years to this work, in the full belief that it was being done for their brother.

3. Plaintiff, in cross-examination, denied that he had ever entered into any contract with either defendant or the sisters for the performance of the work, nor was it pretended that they had received, or were to receive, a dollar of compensation for it.

Now, if I were a lawyer, like your honorable judge, I suppose I could understand how it is that the members of a family could go to a store, buy paper, pay for it, get it ruled at their own expense, take it home, spend several years in calculating and writing on it, in the belief that the work they were doing was their own, and after it was done find that the work belonged to a person who had never seen it. But being ignorant of law, I can not understand it at all. If this were all, I might hope that by a few weeks reading of law in the judge's library my mental vision would be quickened. But this is not all. These people must not only give up their work for nothing, but they must pay over a round sum of cash as damages for not giving it up sooner. I don't believe any amount of legal study would enable me to see the justice of this.

The bias to which I have already alluded prevents me from claiming that plaintiff had no rights at all in or to any share of the work, and disposes me to examine carefully the grounds of those rights as laid down in the decision. The grounds are three in number.

Firstly. It was the plaintiff who "conceived the idea of the work." This is true; but I am pained to say that the court enormously exaggerates the value of such a conception. The head of every working astronomer is full of such ideas. The difficulty is that he can not find anybody willing to spend time and labor in putting them into effect. They are worth just as much as the ideas of steamship lines, factories, new cities and public improvements of all kinds, with which the head of every ambitious man of business is filled. The astronomer, like the man of business, is glad to give the benefit of such ideas to anyone willing to spend time and labor in realizing them. And of all such ideas, that of a star catalog is the most familiar. I think it would be rather exceptional to find an old astronomer who had not prepared, or taken part in preparing, from one to half a dozen such catalogs.

Secondly. Plaintiff "selected the sources from which the stars were to be extracted," or, in homelier English, he bought or borrowed the books containing the observations to be used in the work.

Thirdly. Plaintiff gave the work the great benefit of his "nice discrimination as to the star positions to be selected and the absolute correctness of the work." This means that in some of the books bought or borrowed he marked some stars for insertion in the catalog, and from time to time examined the earlier sheets of the catalog to see that the names were all right, etc. It is not difficult to estimate the true value of such supervision. It was very necessary when an inexperienced astronomer had to start the work. One hour per day for a week or so would be a liberal estimate for the time necessary at the start. After that an occasional hour would do. As a matter of fact defendant soon began to go on in his own way without help. The decision says that for three years defendant carefully concealed the work from plaintiff, and these three years were those in which nearly all the work was done. Certainly plaintiff had a poor chance to exercise "nice discrimination," etc., in the case of a work he was not allowed to see.

Another curious feature of the case is that to find for defendant the judge had to ignore either his own law, or plaintiff's evidence, he does not say which. He lays down this law:

> There would, it seems to me, be a great injustice in holding that for the very small compensation paid to and received by the plaintiff since he became connected with the observatory in 1858, the observatory or the college acquired the right to have and appropriate the results of his literary labors, as an author during all the years.

Now, if the law is no respecter of persons there would be a much greater injustice in holding that, for the yet smaller compensation paid defendant, the observatory, the college or plaintiff acquired the right not only to the labors of defendant, but of his two sisters. The judge says also:

> Whatever the interest of plaintiff was to be, in the catalog, it is not disputed but that the defendant would have actual credit and reputation for whatever he actually did in labor upon the work. * * * * The great labor upon the work, the executive ability displayed in working out the conception of such a work, the untiring industry exhibited in preparing it for publication, were defendant's, aided by his sisters, and all the credit and ability exhibited in these respects belonged, not to the plaintiff, but to defendant, and could not have been properly taken from the defendant.

Here the judge flies right in the face of the facts as brought out by the evidence of both parties. The plaintiff's demand was for the unconditional surrender of the catalog, and defendant's proposal for an understanding as to the credit he should receive, was the occasion of the final break between the parties. On the witness stand plaintiff called the proposition an "impudent" one, and admitted that he was excited by it. On cross-examination he stoutly denied having any bargain about credit or any other compensation; claimed that there was little or no credit in the work, since any one could learn to do it in five minutes, and maintained that defendant had done it because he, plaintiff, had ordered him to do it. I do not believe there is an astronomer living who would not testify that the proposition which the plaintiff called "impudent," and which he tore up and threw into the fire, was, under the circumstances, perfectly reasonable and just. It was simply that the title page should state the exact fact, that the work had been done under direction of C. H. F. Peters by C. A. Borst. In view of this state of things the remarks of the court sound like bitter mockery.

I can not but fear that the microscopic examination of details into which the parties entered on the trial made the court and the public lose sight of the big facts I have set forth. There was an apparent conflict of evidence on all the minor points, which might well perplex one who looked upon the work as a business enterprise, undertaken for profit. But the case is perfectly clear to anyone engaged in teaching science to men who desire to become original workers. It is part of the duty of such a teacher, and the most agreeable part, to promote the progress of those who stand to him in the mixed relation of pupil and assistant. This was the relation in the present case. Mr. Borst was well known in the community as a young man of live business capacity and untiring industry, with a collegiate training in addition. The idea that he would spend several of the best years of his life working night and day, and enlisting his sisters in the work, for the pittance which he received, can not for a moment be entertained. At Harvard, at the Johns Hopkins university and, I suppose, at all the leading colleges and active observatories there are young graduates who remain at the institution to perfect themselves in their chosen science, and show what they can do by working under direction of their professors. They generally receive a small salary. The professor suggests pieces of work to be undertaken, gives them the benefit of his supervision and criticises their performances. When any thing is done the professor advises them whether to publish it. All this is one of

the recognized objects for which institutions of learning are founded and for which professors are paid. It is evident that the defendant supposed that these were his relations to his chief, and acted accordingly until he found that the chief was determined to claim his work as his own. From this point of view the attempts of the prosecution to show that defendant was only a hired hack, swinging the telescope and turning the dome for his employer at $50 a month, are painful to contemplate. I see but one light in which the decision can be viewed with favor, and that is in the prospect it offers to any eminent but impecunious astronomer to make a lawful if not an honest living with little labor. His persuasive powers must be such that he can interest a few bright young ladies in his work and induce them to go thro' his long and laborious calculations. When the work is done he must pick a quarrel with his assistants, and so anger them that they will refuse to give up his work on any terms or conditions whatever. Then he must sue them before any court where Justice Williams' law is accepted. Following strictly the line of argument in the decision before us, the court must find that plaintiff conceived the idea of the work, showed the defendants how to do it, and supervised it with rare professional skill, and that both parties had admitted it to be his. It must therefore belong to him. Following the logic of the law to its grim conclusion, the court would then assess damages in some such fashion as this: From the size of this pile of MS. it is evident that Miss Blank worked industriously, and the value of her productions may be estimated at four dollars per day. She was at work say two years, or 600 working days. Value of the result, $2,400. The most moderate assessment possible will be interest on this value at six per cent., amounting to $144 per annum. Now if the persuasive powers of the astronomer were sufficient to secure the enlistment of a sufficient number of young ladies, he could make a comfortable living out of this source of income when all other means failed. Yours very respectfully,

SIMON NEWCOMB.

Washington, D. C., Nov. 25, 1889.

Mr Ball

D. C. L.
can d

Johns Hopkins University
Baltimore

Maryland

U. S. America

[1/5/91]

Extract from the Records of the Board of Trustees of Hamilton College in Session June 28. 1887.

"Dr. Darling presents his Annual Report as President of the College which was accepted, and the reports of Profs. Hamilton, Burdick, Brandt, Hoyt, Root, North, Bristol & Boast were also read and accepted."

A true copy.

Thos. B. Hudson

Sec'y

[1/5/91]

No. 158.] JANUARY, 1890. [*Price* 1*s*.

THE OBSERVATORY,

A MONTHLY REVIEW OF ASTRONOMY.

EDITED BY

H. H. TURNER, M.A., B.Sc., F.R.A.S.,

AND

A. A. COMMON, F.R.S., Treas. R.A.S.

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Annual Subscription (for the "Companion" and twelve Monthly Numbers):—United Kingdom, 13 *shillings*; Countries in the Postal Union, 14 *shillings*; other Foreign Countries, 15 *shillings*.

LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS,

RED LION COURT, FLEET STREET, E.C.

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THE OBSERVATORY,

A MONTHLY REVIEW OF ASTRONOMY.

No. 158. JANUARY. 1890.

MEETING OF THE ROYAL ASTRONOMICAL SOCIETY.

Friday, December 13, 1889.

W. H. M. Christie, M.A., F.R.S. (Astronomer Royal), *President*, in the Chair.

Secretaries: E. B. Knobel and A. M. W. Downing, M.A.

The Minutes of the previous Meeting were read and confirmed.

Mr. Downing. 110 presents have been received since the last Meeting. Amongst them I may mention a volume (Vol. vi.) of Potsdam Observations, presented by the Observatory; Sir Isaac Newton's 'Chronology of the Ancient Kingdom of Memnon,' presented by Mr. E. B. Knobel; Houzeau and Lancaster, 'Bibliographie Générale de l'Astronomie,' Tome i. 2e partie, presented by Mr. A. Lancaster; A. Auwers, 'Neue Untersuchungen über den Durchmesser der Sonne: III.,' presented by the Author; F. Kaiser, 'De Sterrenhemel,' 4th ed., edited by Prof. Oudemans, Vol. ii., presented by Prof. Oudemans; Le Verrier, 'Recherches Astronomiques,' Tomes ii.–xiv., presented by M. Magne.

Mr. Downing. I should like to draw attention to these 13 volumes of Le Verrier's 'Recherches Astronomiques,' which M. Magne, Le Verrier's son-in-law, has generously presented to the Society. Unfortunately he was unable to complete the set of 14 volumes, as he had no more spare copies of Vol. i. These 'Recherches Astronomiques' have been extracted from the volumes of Paris 'Annales,' and contain Le Verrier's work on the Sun and Planets. We hope to be able to complete the set by obtaining a copy of Vol. i. elsewhere.

A vote of thanks was passed to the donors.

Mr. Maunder then read a paper by the *Rev. Mr. Cortie*, entitled "A Note on the Spectrum of the Sun-spot of June 1889." After reading the paper throughout, *Mr. Maunder* remarked:—These observations will be of especial interest if the prognostic I

ventured to make at the last meeting of the Society should prove correct, and the large spot of June 16 be, as I supposed, the first of a new period. For in that case we have a spot not only important as to size, but important also spectroscopically, with which to begin this new cycle; and I think we may congratulate ourselves that it has been so well observed, both in the spot itself and in the prominence connected with the spot. The fact Mr. Cortie has recorded with regard to this spot—that the lines of calcium which were most affected in the spot itself were the same as those shown in the prominence—is not at all an unusual circumstance. Mr. Lockyer pointed out, several years ago, that whilst in the spectrum of iron we should frequently find one set of iron lines affected in a spot and another in the flame, yet in regard to calcium we found the same lines in both. Of the lines observed to be broadened, usually those that were most broadened were those which Mr. Lockyer has been accustomed to call his *basic* lines,—lines, that is, ascribed to two or more elements. But the line which was most brilliant in the prominence, and which on one day was much the most widened, was one entirely due to calcium. Probably the reason why Mr. Cortie seems to have chiefly observed calcium in this spot is that his attention was mainly confined to the red end of the spectrum, and in this region the calcium lines are generally the most conspicuous. Further up, in the yellow or green, other elements are more conspicuous in spot-spectra, but here, in the red, calcium is undoubtedly the most conspicuous.

There is a work about to be begun at Stonyhurst which was certainly much wanted, and it is a great cause for congratulation that it is going to be commenced, now that we are entering upon a new solar period—and that is, the regular photography of sun-spot spectra. A photographic record of sun-spot spectra will have a great advantage over eye records in that it can be referred to afterwards; and if there is any difficulty or doubt, the question can be settled by a reference to the photographs. I may give an instance from my own experience. In the earlier observations which I made at Greenwich of the spectra of sun-spots, I noticed lines to be broadened over the spots which were mostly those of well-known and well-marked Fraunhofer lines; but as time went on I found the broadened lines were lines which are not ascribed to any element, or were even lines not seen on the general disk. I began to wonder then whether this was a real change, or whether, when fresh to the work, I had had my attention chiefly caught by the more familiar and conspicuous lines of the ordinary spectrum; and that now, when I had become more acute and experienced at the work, I was able to recognize the relatively greater change taking place in the fainter lines. But I found that precisely the same observations were being made at the same time at South Kensington, so I think there need be little doubt that there was a genuine change in the character of the spot-spectra. But if my

observations had stood alone it would have been very possible to have accounted for them by supposing that, when fresh to the work, I had naturally been attracted to the more conspicuous lines, but that afterwards, when I had had more experience, I had been able to observe less important lines. But of course, if we had a photographic record, we could easily go back and consult the old photographs, and no doubt of that kind could arise.

Mr. Wilson read a paper on "A Method of recording Transits of Stars by Photography." He said that the time of the transit could, by the method he employed, be recorded to one quarter of a second, and he thought with care it could be much more reduced. The telescope he used was a 4-inch finder of a With reflector. The object-glass was not corrected for photographic rays, therefore the image was not so sharp as it might be.

Mr. Common. I should like to ask if this is a new method of recording the movement of stars by photography.

Mr. Wilson. I think so.

Mr. Common. I have a distinct remembrance of such a thing having been exhibited some four or five years ago in which the end of the star-trace was indicated by the motion of the plate, and it recorded the position of the star at the time the plate was moved.

Mr. Wilson. You mean the plate only got one motion; but in this case the plate is moved up and down each second.

Mr. Common. The question is whether the fiducial point is an interruption of the trace in both cases. I think the apparatus I mentioned was exhibited at the Inventions Exhibition; and I am not sure that Whipple of Kew had not something to do with it*. The whole thing in principle depended on the interruption of the line on the plate by means of some motion given to the plate.

Col. Herschel. I think that alters the case. I am quite sure there was something of the sort.

Mr. Wilson. I mentioned it to Sir Howard Grubb, and he never heard anything about it before, nor had Dr. Huggins.

The President. I would ask the author whether he found any difficulties from the tremulous motion of the atmosphere.

Mr. Wilson. The motion was only about $\frac{1}{50}$ of an inch up and down, and that is very small.

The President. It is a very important subject, and it would be well if some efficient means could be devised to record transits of stars. There are serious practical difficulties in the way; and I am not aware that any method has yet been found effective. I think we may return our thanks to the reader of this paper.

Mr. Knobel then read a paper by Prof. Holden on "Some of the

* [*Note by A. A. Common*:—Mr. Whipple, of the Kew Observatory, gives, in the 'British Journal Photographic Almanac' for 1885, p. 44, suggestions for a similar plan to that proposed by Mr. Wilson; it does not appear, however, that Mr. Whipple ever tried it.]

Features of the Arrangement of Stars in Space." The paper stated that a 6-inch portrait-lens was used for the observations to which reference was made, and after dealing in great detail with the observations made, the writer of the paper went on to say that the most marked feature on the plate was the whole arrangement of stars near the nebula mimicking the arrangement of the nebula itself. He had made entirely independent drawings of the observations on different days, and they had agreed in all the main features. Small differences must occur until the real law governing the stars' configuration is known, and it appeared to him to be tolerably certain that the present results of observations were a step towards the discovery of such a law. When they found groups of stars several degrees in diameter they clearly belonged to one system; and when these groups were connected with each other their conception of the heavens was again widened. The discovery of typical forms of this great nebula in other distant parts of the heavens was very magnificent. It was difficult, in words, to convey the impression, to the minds of those who had not the originals before them, that the streams were drawn impartially. It was obvious, however, that the imagination must play some part, and so far as it did it must be harmful. He, however, desired to draw attention to the existence of these matters without laying too much stress upon any special interpretation of their meaning.

Col. Herschel. Well, Sir, I think we hardly ever have a paper of which it can be said that any present discussion is to be deprecated more than of this paper. It is impossible to arrive at any safe conclusion on a paper containing so much to startle one as this does, from merely hearing it read. I think that any present discussion would very likely do injustice to the author. I certainly dare not attempt to discuss the details of it myself *.

Capt. Noble. I should just like to say that the whole thing appears to me to be one in which the imagination may play a much larger part than Prof. Holden seems to attribute to it. When I was a boy we used to make six dots, and draw lines from one dot to another to make little men of them; and no two boys would join them in the same way. I have a strong conviction that if the originals of the drawings exhibited were placed before six separate men, and they were shut up and called upon to draw lines through the most striking groups of stars, you would have six maps of very different figures. I saw an instructive illustration of this a little while ago. A very great astronomer, a Fellow of

* [I beg permission to say that I opened the discussion on Prof. Holden's paper with reluctance, and partly because the pause, which always follows the President's call, was in this instance (as it seemed to me) so prolonged as to be getting painful. As a friend of Prof. Holden's, I was anxious that a paper, which might so easily be criticized hastily, should be spared till we could *read* it; and I hoped that the prolonged pause might in fact be indicative of a general feeling to that effect. As a fact, my first words—"Well, Sir"—partly showed this attitude.—J. H.]

the Society who is not present this evening, showed me what I certainly thought was a star-map, in which the curious disposition of the stars to take certain forms and various marked curves was very apparent. He said—"Do you know how it was done?" I replied "No; it is a map of the stars of some sort, I think." To which he answered that his wife had made it with a tooth-brush and some Indian ink drawn at random over a comb!

Mr. Ranyard. If I understand the paper rightly, Prof. Holden admits that there is a danger of giving play to the imagination. I was much struck by a remark made by Mr. Common some little while ago with regard to this; and very shortly after it was raining, and I thought I recognized an arrangement of the drops on the pavement in curves around empty spaces. I then tried an experiment by throwing the drops down from a hair-brush. The mind has a tendency to arrange such random drops in curves; but admitting this, I think there is evidence of some arrangement among the stars. For example, in the Pleiades Nebula one can hardly doubt that the long filaments of nebulous matter threading the lines of stars is not a mere matter of chance. I admit that the stars are not accurately bisected—some lie slightly on one side of the line and some on the other; and yet I cannot doubt that there is a connection between the stars and the nebulous streaks, and that these stars lying nearly in a straight line are physically connected. After examining the Andromeda Nebula I cannot doubt that there is an arrangement of stars upon the bright wisps or spirals; and though perhaps some of the arrangements spoken of by Prof. Holden may be imaginary, still I think there is a residue which has a real basis of fact and are very well worthy of study.

Mr. Common. The matter of the arrangement of the stars has been discussed in this room several times already, and also the peculiar grouping they seem to assume. Touching the production of star-charts in the simple way Capt. Noble has alluded to, Dr. Huggins sent me about a month ago what I thought to be a most elaborate star-chart until I read his letter, which told me his wife had produced it by the very simple means Capt. Noble has mentioned; and on hearing this paper was to be read to-night, I asked his permission to allude to this matter, because it has a very important bearing upon the question of the distribution of stars, as we see here the same line of streams and ovals which Prof. Holden discovers in the photographs. Of course he is perfectly right in saying that the person who has been observing with a small field never sees a sufficient number of stars (which one would get on the photograph) to trace any such peculiarities as he considers are due to structure. What has always struck me in observing small fields of stars is that there is a tendency to symmetrical or geometrical arrangements. You get squares, triangles, and crosses. The triangle is a very common form; you see that time after time with certain magnitude stars. If you use a higher power you

see other stars lower down, and you see smaller arrangements there. If you group the stars in masses you find simple figures become, by a stretch of imagination, curved lines. I think Prof. Holden has rather unduly hastened towards conclusions which are not warranted. I do not think we have any reason to suppose that we are going to find the structure of the heavens at one magnitude. The whole of the heavens are not made up of stars of the 11th or 12th magnitude alone, and to take these stars without reference to stars beyond would, I think, hardly be right. If anyone will look at these things produced by Mrs. Huggins they will see the peculiar arrangement Prof. Holden did, and see how far he is justified in concluding from an examination of photographs anything that can be made from those artificial charts. Dr. Huggins told me that Mr. Nasmyth told him he had endeavoured to produce an artificial map of the stars by dashing drops of water with a brush.

The President. I think you will find some stars of the same magnitude in these artificially-produced star-charts which form very curious lines.

Col. Herschel. A curious thing which Prof. Holden lays some stress on in the early part of the paper is the identity of the magnitudes of the stars forming the configurations he speaks of. That is a very marked feature of that part of the paper; and I think that it is a little unfortunate—that Prof. Holden has been perhaps a little hasty in giving his views, however correctly formed, in a way that it is impossible for his readers to test. They are sure to form incorrect notions if they cannot see the *data* which he has got before him.

Mr. Ranyard. The stars upon the nebulous lines in the Nebula of the Pleiades are not all of the same magnitude, and in the Andromeda Nebula the stars on the nebulous streams are not all small stars and they are not all of the same magnitude.

Mr. Common. If it were possible to investigate the arrangement of the stars at different angles of R.A., we might possibly find whether there was not a predisposition in those streams to vary at different hour-angles. If the lenticular theory of the distribution of stars is correct, we might find a preponderance of streams showing ellipses almost edgeways, and at six hours difference we might see them more on plan.

Mr. Knobel. I agree with Col. Herschel that we may be doing an injustice to Prof. Holden by not having the same examples before us that he had. One particular feature Prof. Holden lays stress upon is the photograph of the Andromeda Nebula. He lays much stress upon the point that he finds stars which seem to mimic the oval form of nebulæ as shown in Mr. Roberts's photographs. I have studied the positive he has sent to illustrate his paper; I have spent some time in examining it. I certainly failed to detect the feature he laid so much stress on at all. I think in looking at the photograph he has sent us we are not in a fair

position to judge of the merits of the views he expressed, in not having the original negatives before us which he says show and exemplify the point so much more conspicuously.

Mr. Common. I understand we have the positive here upon which he based his speculation.

Mr. Knobel. He bases his speculation upon the original negative.

Mr. Common. That positive is practically better. Here we have a positive copy of the original negative upon which the original speculation was based, and that is as good as the negative for that purpose.

Mr. Ranyard. I should like, with regard to that, to say I have a copy of the photograph, and I also think that I trace elliptical curves of stars outside the nebula.

Mr. Knobel. Of stars?

Mr. Ranyard. Yes, of very small stars. I conclude that is what Prof. Holden refers to. There is a point I should like to mention: the axis of the small nebula and the axis of the great Andromeda Nebula are certainly not parallel with one another, and they certainly are not parallel with the axis of symmetry of the Orion Nebula; and there is no parallelism between the nebulous lines in the Pleiades and the axis of the Orion Nebula.

The President. It is evidently a very speculative question and one on which there is room for very great difference of opinion; but it is desirable that the matter should be thoroughly ventilated and discussed.

A vote of thanks was passed to Prof. Holden for his paper.

Mr. Downing then read a paper by *Mr. J. E. Gore*, "On the Orbit of Struve 228."

Mr. Downing said, I should like to point out the very valuable work which Mr. Gore is doing in his computation of the orbits of double stars. It is all very well for observers to measure double stars, but it is not sufficient in itself. The work must be supplemented by calculation, and it is greatly to the advantage of our science that a man like Mr. Gore should have the leisure, ability, and energy to keep watch on the double stars, and, when he thinks he sees indications of motion of a binary character in looking through the observations, to spend his time in computing the orbits. I hope we shall see a great many more orbits computed by him.

Mr. Knobel. We have a paper by *Mr. Marth* on "Ephemerides for Physical Observations of the Moon." It is not a paper I propose to read; but Mr. Marth calls attention to one point which I desire to bring before the notice of observers. Next month he contemplates sending us a list of lunar sketches he has been able to obtain, with particulars referring to the sketches, to the particular time of their relative positions on the surface of the Moon; but he complains and he calls attention to the thoughtlessness of people in not recording the times of their observations,

and he has complained very much that in a number of drawings and sketches which have been sent to him so many are deficient in having the time properly recorded on them, and he desires me to mention to the Society that it is most important, and that lunar sketches cannot be inserted in the list if they have not the approximate time, and that any deficiency should be supplied without delay. I mention this in the hope that observers who have furnished Mr. Marth with lunar sketches will furnish them with the times when the observations and the sketches were made.

Mr. Knobel said that a paper had been received from Mr. G. M. Seabroke, "On Spectroscopic Observations of Stars in the Line of Sight, made at the Temple Observatory, Rugby," but was not suitable to read.

Mr. Maunder. I have not had the opportunity of seeing Mr. Seabroke's paper until this moment; but a glance through his results shows me that he has observed a motion towards the Earth in almost every case. I do not know whether he has given any explanation of the circumstance in his remarks; but it certainly seems to suggest some systematic error. I compared the results Mr. Seabroke published in 1887 with those of Dr. Huggins published in 1872 and with my own up to the end of 1887, and there was then a very fair agreement indeed between the three series, except in the case of the seven brightest stars of Ursa Major. My own results agreed well in the mean with those of Dr. Huggins, but Mr. Seabroke's were very discordant from both. This may easily be explained, for Mr. Seabroke told me that in observing these stars he was obliged to adopt a very awkward position. He had observed at that time 38 stars that I had also observed, and leaving out the seven Ursa Major stars, for the other 31 we agreed in almost every case as to direction of motion, and in many instances fairly closely as to the speed of motion. I should therefore be inclined to think that these more recent results of Mr. Seabroke must be affected by some systematic cause, for they are almost without exception in the same direction and are exceedingly large.

Whilst on the subject of motion in the line of sight I may mention that Prof. Vogel has been trying photography for this work, and it appears admirably suited for it, as to a great extent it gets over the difficulties arising from atmospheric tremors. It is always difficult to bisect the broad diffused lines of first type spectra; but the difficulty is much enhanced when the images are not steady and the whole spectrum is "boiling" like the Sun's limb on a bad day. Prof. Vogel says that the photograph is not affected by these atmospheric tremors, for as the exposure is very prolonged, say an hour or two hours, during that time the different vibrations have eliminated each other, and we get a good image as the final result. He has recently obtained some particularly interesting observations of Algol, at some considerable time before and after minimum. The suggestion was early made, as you know, that the variability of Algol was due to a dark satellite which caused a periodical

eclipse of its primary, In this case Algol must itself be moving round the common centre of gravity of the system, and be sometimes approaching us and sometimes receding from us. Prof. Vogel's observations fully confirm this view, for he finds that the star is rapidly receding from us before minimum and approaching us after minimum. The difference in the rate of motion at the two elongations as observed by Prof. Vogel is 53 miles per second, very nearly the same as I have obtained by eye-observation at Greenwich, which was 46 miles per second; but he makes the two motions nearly balance each other, whilst I get a considerable motion of approach for the entire system. It would appear therefore that the photograph or the observer is affected by some personality. Of course the personality would go out in determining the motion of the star in its orbit, but would affect the motion of the entire system towards the Earth.

Mr. Downing. With regard to these spectroscopic observations of motions of stars in the line of sight, I should like to throw out a suggestion. It would be well if observers could measure the relative approach and recession of the stars forming a binary system. It would be necessary to have a double star, both components of which were bright, and to have the plane of motion nearly at right angles to the plane on which we see the system projected, so that in one part of the orbit one of the components would be advancing towards the observer and in the other part receding from him. These conditions are very nearly fulfilled in α Centauri, and I should think that observers at Melbourne and Sydney might very well undertake to make the observations there.

The President. Prof. Charles Niven, at Cork Observatory, came to the same conclusion as Mr. Downing that α Centauri was the only star from which promising results were likely to be obtained. Since then another astronomer has proposed the same method with very much the same result. I must ask you to return your thanks to Mr. Seabroke and Mr. Maunder. That concludes the papers for this evening; but I think it may interest you if I give you some idea of the progress that is being made in the work of photographing the heavens. I have been over to Dublin to Sir Howard Grubb's works; he is engaged in making instruments for Greenwich, Oxford, the Cape, Mexico, Sydney, and Melbourne. He has already sent off the instrument to Mexico, for which he has succeeded in making a photographic object-glass which has given very satisfactory photographs under the unfavourable conditions of this time of year; and he is now engaged with the other instruments. The Greenwich photographic equatorial is finished and mounted, and he has used it to test the object-glasses for the other instruments. I was much interested in a photograph with an exposure of 20 minutes, during which time the instrument was driven by the clockwork without being touched by hand. The images of stars appeared to be round and well-defined, and two double stars were shown very nicely divided—a very satisfactory result. With

regard to the object-glasses, it must be remembered that they require the study of quite a new branch of optics, because it is quite a different matter to get a good definite centre of field and to deal with a field extending over a degree from the centre. On a photograph taken with the Mexican object-glass very fair results were obtained at 80′ or 90′ from the centre. There is another point I may mention. We have been waiting at Greenwich for a 28-inch object-glass, which is now well under way. Sir Howard Grubb is working closely at it, so I hope before very long we shall have it installed at Greenwich. It will then be possible to take up this photographic research into the motion of stars in the line of sight and other work of that character, and we hope that we shall be able to apply photography to the spectra of stars and other work where a very large field is not required. With this particular form of object-glass a large field cannot be obtained. The field is limited to 30 minutes from the centre; but such objects as the Sun and the Moon might very well be photographed up to the extent of the field. I thought that Fellows might be interested in knowing that this work was going on. There have been some delays in the early stages because the work been largely experimental.

Captain Noble reminds me that lately the practice has been adopted of putting a notice of the papers to be read at each meeting in the 'Times' of the Thursday preceding, in order that Fellows in the country might know what is coming on. It is very desirable, therefore, that authors of papers should send them in on the Tuesday before the meeting and not at the last moment, as in that case no information can be practically given.

A Fellow suggested that the list of papers should be posted in the Hall.

The President asked that Fellows would send in their papers earlier, and the Council would then give the fullest information possible to the Meeting.

The following papers were announced:—

Rev. A. L. Cortie. "Note on the Spectrum of the Sun-spot of June 1889."

W. E. Wilson. "A Method of Recording the Transits of Stars by Photography."

J. E. Gore. "On the Orbit of Struve 228."

A. Marth. "Ephemeris for Physical Observations of the Moon, 1890 Jan. 1 to July 1."

G. M. Seabroke. "Spectroscopic Observations of the Motions of Stars in the Line of Sight, made at the Temple Observatory, Rugby."

R. L. J. Ellery. "Spectra of Southern Stars observed at the Melbourne Observatory with the McClean Direct-vision Spectroscope attached to the South Equatorial.—No. II."

Prof. E. S. Holden. "On some of the Features of the Arrangement of Stars in Space." [This paper was announced at last Meeting, but not read until this.]

Alfred Fowler, Demonstrator of Astronomical Physics, Normal School of Science, South Kensington; *Joseph Kleiber, Privat-Docent of the University of St. Petersburg*, 56 Great Morskaia; and *David Smart, L.R.C.P., M.R.C.S., L.S.A.*, 108 Grange Road, London, S.E., were duly elected Fellows of the Society.

The following Candidates were proposed for election:—

James Blair Forgan, 15 Pall Mall, S.W. (formerly Assistant in the Royal Observatory, Edinburgh) (proposed by C. Piazzi Smyth); *Richard A. Gregory*, 115 Rylston Road, Fulham, S.W. (proposed by J. N. Lockyer); *A. N. Harris*, Hotel-keeper, 21 Lambhay Road, Plymouth (proposed by Rev. J. M. Bacon); *Frederick William Henkel, jun.*, Merchant, 32 Berwick Road, Walthamstow (proposed by J. D. McClure).

Mr. W. B. Gibbs, *Mr. R. J. Lecky*, and *Mr. E. W. Maunder* were appointed Auditors of the Treasurer's accounts for 1889.

MEETING OF THE ASTRONOMICAL SOCIETY OF THE PACIFIC.

1889, November 30.

Mr. W. M. Pierson, *Vice-President*, in the Chair.

The Meeting was held at the hall of the California Academy of Sciences, in San Francisco.

Twenty-seven members were elected. Among the prominent names of the new members are to be found Miss Agnes Clerke, the author of 'History of Astronomy,' and Miss C. W. Bruce, of New York City, to whom Harvard College Observatory is indebted for the funds for the Bruce photographic telescope.

The total membership of the Society now is one hundred and seventy-one.

A paper was read by Mr. A. O. Leuschner, "On the Determination of the Relation between the Exposure-time and the consequent Blackening of a Photographic Film."

This paper dealt with an investigation of a plate upon which a number of standard squares had been impressed by the standard lamp of the Lick Observatory. These squares had been given exposures of $1^s, 2^s, 4^s, 8^s, \ldots . 128^s$, and were then compared with each other and with a standard square by means of the wheel photometer of the Lick Observatory. Every precaution was taken to eliminate errors of observation in the comparisons. An extended series of observations showed that the density was proportional to

the time only between the exposures 2^s and 8^s, and with an approximation up to 64^s; beyond this the density was not proportional to the time. Mr. Leuschner also found that squares of the same exposure-time on different parts of the same plate were not equal in density—due doubtless to the unequal distribution of the emulsion on the plate, and therefore the above results were derived from comparisons with the deduced mean of four squares in each case

The principal paper of the evening was read by Mr. Barnard, "On some Photographs of the Milky Way, the Andromeda Nebula, &c." The photographs were taken with a large portrait-lens of 6 inches aperture and 31 inches focus. This lens was strapped on the tube of the 6½-inch equatorial of the Lick Observatory, the clockwork of that instrument being controlled by hand with the slow-motion rods at the eye end. A star was kept bisected by the cross wires in a high-power eyepiece on the 6½-inch itself. The additional weight of the camera made it necessary to constantly correct the clock throughout the exposures. With this instrument a negative of the Pleiades was taken on August 23, with an exposure of $1^h\ 15^m$. This showed the Merope Nebula conspicuously, the sharp prong of nebulosity from Electra, and some of the nebulosity about Maia and Alcyone. A negative of the Milky Way ($17^h\ 57^m$—$18°{\cdot}9$) was secured on July 28 with an exposure of $2^h\ 35^m$, another of the region about M 11 on Aug. 2nd with $2^h\ 45^m$ exposure, and another of the Milky Way ($17^h\ 56^m$ —$28°$) on August 1st with an exposure of $3^h\ 7^m$, and a negative of the Great Nebula in Andromeda on August 26 with $4^h\ 18^m$ exposure.

The paper was illustrated by lantern-slides from these plates. These were projected on a large screen by the oxy-hydrogen light. The nebulosities of the Pleiades were very conspicuous to the audience, and the beautiful cloud forms of the Milky Way with the myriads of stars into which they were partially resolved were exquisitely shown. The slide of the Great Nebula of Andromeda when first projected on the screen had a mask over it with a small hole representing (to scale) the largest field of the Great Telescope on Mount Hamilton; this was moved about over the slide, showing successive fields of view over and around the Great Nebula; only a small portion of the nebula could be seen at once: the mask was then suddenly removed and the entire nebula, suspended amidst countless stars, flashed into view. The contrast between the limited space representing the field of the great telescope and the sky as shown by the photographic lens was startling in the extreme. This slide showed the great nebulous rings that were first proved to exist by Roberts*. Mr. Barnard has estimated, by carefully counting areas, that the original negative of the Andromeda Nebula (8 × 10 inches) contains sixty-four thousand stars that can be distinctly counted. This entire plate had been reduced to a lantern-slide, which brought out peculiarities of arrangements in the stars

* [See letter from Rev. M. H. Close on p. 54.—Eds.]

that were not even suspected in the original negative. In all these photographs the stars were perfectly round.

Mr. Leuschner communicated an orbit of Swift's new comet which he had computed from observations by Mr. Barnard at the Lick Observatory on Nov. 20, 21, 22. He called attention to the small inclination and to the perihelion distance, which were suggestive of periodicity. The following are the elements:—

		O−C.	
T	= 1889 Dec. $11^d{\cdot}8493$.	$d\lambda \cos \beta$	$= + 1'{\cdot}2$
Ω	$= 306^\circ\ 25'$	$d\beta$	$= + 0'{\cdot}0$
ω	$= 116\ 24$		
i	$= 6\ 47$		
$\log q$	$= 0{\cdot}0633$		

After the papers had been read, Chairman Pierson announced another gift to the Society of two thousand five hundred dollars, free of all conditions. This is the generous gift of Alexander Montgomery, Esq., one of our life members. It has been suggested that this donation should be used in establishing a permanent fund for a gold medal, to be given annually for the best paper read before the Society. If this is carried out it will be the second medal of the Society, Mr. Joseph A. Donohoe having established a perpetual fund for a medal for the discoverers of comets after January 1st, 1890.

Papers were announced to be read by Professors Holden and Keeler, but on account of their absence were laid over until the next meeting.

CHARLES BURCKHALTER,
Secretary.

MEETING OF THE ROYAL METEOROLOGICAL SOCIETY.

1889, December 18.

Dr. W. MARCET, F.R.S., *President*, in the Chair.

THIRTY-NINE new Fellows were elected.

The following papers were read:—

(1) "Report of the Wind-Force Committee on the Factor of the Kew pattern Robinson Anemometer." This has been drawn up by Mr. W. H. Dines, who has made a large number of experiments with various anemometers on the whirling-machine at Hersham. Twelve of these were made with the friction of the Kew anemometer artificially increased, seven with a variable velocity, and fourteen with the plane of the cups inclined at an angle to the direction of motion. In discussing the results the following points are taken into consideration, viz.: the possibility of the existence of induced eddies, the effect of the increased friction due to the cen-

trifugal force and gyroscopic action, and the action of the natural wind. The conclusion that the instrument is greatly affected by the variability of wind to which it is exposed seems to be irresistible; and if so, the exact value of the factor must depend upon the nature of the wind as well as upon the mean velocity. There is evidence to show that during a gale the variations of velocity are sometimes of great extent and frequency, and there can be but little doubt that in such a case the factor is less than 2·15. The one point which does seem clear is that for anemometers of the Kew pattern the value 3 is far too high, and consequently that the registered wind-velocities are considerably in excess of the true amount.

(2) "On testing Anemometers," also by Mr. W. H. Dines. The author describes the various methods employed in the testing of anemometers, points out the difficulties that have to be encountered, and explains how they can be overcome.

(3) "On the Rainfall of the Riviera," by Mr. G. J. Symons, F.R.S. The author has collected all the available information respecting rainfall in this district, which is very scanty. He believes that the total annual fall along the Riviera, from Cannes to San Remo, is about 3 inches, and that any difference between the several towns has yet to be proved.

(4) "Report on the Phenological Observations for 1889," by Mr. E. Mawley. This is a discussion of observations on the flowering of plants, the appearance of insects, the song and nesting of birds, &c. Taken as a whole 1889 was an unusually gay and bountiful year.

Stellar Spectroscopy at the Lick Observatory.

Only preliminary experiments in the way of starlight analysis have yet been made with the giant telescope of Mount Hamilton. They include no measurements, and their results can accordingly claim no definitive authority; yet they are of considerable interest. Nowhere in the world is there to be found such a happy combination of instrumental power with atmospheric translucency as at Lick; and hence nowhere in the world are the same advantages offered for deciding questions in which "seeing" is mainly concerned. But "seeing" is all-important in determining the peculiarities of faint stellar spectra.

No. 4 of the 'Publications of the Astronomical Society of the Pacific' contains some descriptive particulars of four stars examined by Mr. Keeler among many others in the course of last summer, with a small spectroscope attached to the 36-inch equatoreal. The first is γ Cassiopeiæ, the spectrum of which, as regards hydrogen emissions, was then in what we may call its normal state. C and F showed "brilliant, narrow, and sharp;" the line near G

was just perceptible; but D_3 was absent. Whether of bright or of dark lines, there was no trace in its neighbourhood.

The helium ray, never of primary importance in the spectrum of this star, was observed in it both by M. von Gothard and by M. von Konkoly in August 1883 *, and has apparently been seen by neither since. It certainly remained invisible throughout 1884 †, and only reappeared (so far as we have been able to discover) September 19, 1888, when it was faintly perceived by Mr. Maunder‡. With the bright C and F recorded by Von Konkoly September 16 and 17, 1885 §, it was evidently not associated; nor did it come into view May 21, 1886, when C shone with extraordinary distinctness through somewhat murky air ‖. It evaded Dr. Copeland's scrutiny January 11, 1887 ¶; and Mr. Maunder expressly notes it as unseen on three nights—February 16, December 5 and 16—of the same year. Further observations, if extant, would be of interest, since there is no point of more perplexing significance in sidereal physics than the relations of the enigmatical D_3. Incapable (so far as present experience goes) of existing in recognizable form apart from ignited hydrogen, it yet asserts its individuality by varying markedly on its own account. Its prolonged absence from the spectrum of γ Cassiopeiæ while the hydrogen lines were affected by numerous alternating fluctuations, adds one more remarkable trait to its natural history.

For the rest, the green section of the same star's prismatic light was perceived by Mr. Keeler to be delicately ruled with numerous fine lines, of which the *b* group was the most prominent; and contrast with them may perhaps have evoked a sort of glinting as of brighter spaces in the same region, baffling attempts to fix its exact nature.

Two variables of long period, U Cygni and V Cygni, both very red and both characterized by spectra of Father Secchi's fourth type, lie within about $3\frac{1}{2}$ degrees of a great circle of each other, and not much farther from α Cygni. Their examination at Lick coincided rather unluckily with so low a state of activity in each that the distinctive features of neither spectrum were conspicuous. Yet an impression of the existence in that of V Cygni of three bright lines in the green and yellow was so strong, as in great measure to hold its own against the plausible opinion of their being merely the edges of vivid zones. The study of bright lines in the spectra of variable stars is in its infancy, but it seems *à priori* unlikely that they can persist through the entire cycle of change; and V Cygni must have been near the minimum due in August 1889 at the time of Mr. Keeler's observation. Its repetition as the star recovers its light might prove of extreme value. The

* Astr. Nach. Nos. 2539, 2548.
† Ibid. No. 2651.
‡ Monthly Notices, vol. xlix. p. 301.
§ O'Gyalla Beobachtungen, Bd. viii. p. 6.
‖ Ibid. Bd. ix. p. 57.
¶ Monthly Notices, vol. xlvii. p. 93.

question whether spectra of the fourth type are capable, under any circumstances, of including rays of emission, imperatively claims an answer. Upon it largely depends the place proper to be assigned to "carbon-stars" in schemes of physical classification. A gaseous spectrum implies (we cannot but suppose) an early stage of development; and its display would free these singular objects from the imputation of decrepitude still partially attaching to them. It is not indeed likely to consist of hydrogen lines, between which and carbon bands there seems to be a species of incompatibility. In no comet has a trace of hydrogen been hitherto spectroscopically manifested; and the atmospheres of fourth-type stars appear to be of an essentially cometary nature. Analogy, then, might lead us to expect that the elements (if any) kindled in them to exceptional incandescence would be sodium and iron. But the event will decide. Let us not prophesy—until we know.

V Cygni is one of several variable stars wearing at times a curiously diffuse telescopic aspect. On July 19, 1881, six weeks aftes a maximum, Lindemann observed it at Pulkowa as an indistinct coppery disk. A year later, six weeks before the maximum of August 31, although deeply coloured, it showed not a vestige of nebulosity. On October 8 in the same year it was noted as dusky red and very diffuse; while its image, nine days later, was point-like, stellar, and precise *. Similar observations have heen made by Mr. Peek on R and S Cassiopeiæ, V Cancri, and S Coronæ, and by Mr. Knott on U Geminorum (a dull-white or bluish star). It is extremely difficult, however, to believe that they represent physical changes of the prodigious extent requisite to explain them. Up to this the effects in question have only (to the best of our knowledge) been perceived with refractors; should they at any time be recorded with the help of reflectors, the case for the objective reality of the fitful variations they seem to indicate will be much strengthened. In the meantime we may provisionally refer them (as Dr. Copeland referred the disk of the semi-effete Nova Cygni) to optical causes depending upon the colour correction of the telescopes employed.

In the same neighbourhood with the pair of Cygnus variables is a 7·5 magnitude star, D.M. +43°, No. 3571, found, through Mrs. M. Fleming's examination of three of the Draper Memorial plates, to give a gaseous spectrum of the kind so extraordinarily prevalent in that constellation. It contains two fundamental bright lines, one yellow (wave-length 580), the other intense blue (wave-length 467), connected by a *bridge* of dim light. Mr. Keeler now makes the interesting announcement that in all such objects inspected by him, the (in small instruments) apparently continuous part of the spectrum is in fact "an extremely complicated range of absorption-bands and faint bright lines." Thus the last remnant of a sun-like character disappears from the members of

* Bull. de l'Acad. Imp. t. xxix. p. 302.

the Wolf-Rayet group, γ Argûs only excepted. From the first they visibly hovered near the frontier of the two great sidereal kingdoms; now they may be considered to have definitively taken up positions in the realm of nebulæ. A. M. Clerke.

Notes on Comets and Comet-seeking.

The Tails of large Sun-grazing Comets.—The large comets of 1680, 1843 I., 1880 I., 1882 II., and 1887 I. were noteworthy, not only for their brilliant appearance but for their very small perihelion distances, which caused them to nearly graze the Sun's surface. And it may be mentioned as a curious circumstance that the tails of four of these bodies presented features of close resemblance. They were distinguished by their *great length* and *narrowness* as opposed to the spreading and sometimes fan-like tails of many other large comets.

The comet of 1680 had a tail at the middle of December fully 70° long. At Constantinople it was estimated as 90°. "It was perfectly straight and very narrow, the breadth of the middle was only 2° and at the end 3°" (Breen's 'Planetary Worlds,' p. 270).

The comet of 1843 I. had a tail 70° long, and it was remarkable for the smallness and regularity of its breadth. "From the vicinity of the head to the opposite extremity, its breadth, which was almost constant, was 1° 15′ on March 18 and 19, and it was uniformly white" (Arago's 'Popular Astronomy,' Engl. ed. pp. 561–2). "The tail was very different from those of other comets, which are generally ten or twelve times as broad at the extremity as at the head" (Breen's 'Planetary Worlds,' p. 274).

The comet of 1880 I., as seen by Mr. Eddie at Graham's Town on Feb. 5, had a tail 50° long and about 1° wide. Mr. C. Todd observed it on Feb. 1, and remarked that "the tail appeared as a narrow whitish auroral streak" ('Monthly Notices,' vol. xl. pp. 298–9).

The comet of 1882 II. displayed a tail 23° long early in November, but though narrower than that of some other fine comets, it was somewhat wide at the extremity and curved. On Nov. 9 Tempel estimated its length at 20° and breadth at end $3\frac{1}{2}$°. On Nov. 12 his values were 19° and 5° respectively. It cannot therefore be said that this comet, like its predecessors in 1680, 1843, and 1880, exhibited special narrowness or length of tail.

The comet of 1887 I., as described by Mr. Finlay at the Cape on Jan. 22, "presented the appearance of a pale narrow ribbon of light quite straight." On the same night Mr. Todd, at the Adelaide Observatory, saw the comet, and says it had "a long narrow tail of about 30°, resembling in fact very closely the appearance of the comet of Feb. 1880" ('Monthly Notices,' vol. xlvii. pp. 303–5).

Long, narrow tails would therefore appear to be a characteristic feature of these bright Sun-grazing comets, for other large comets, such as have normal perihelion distances, do not display them.

The great comet of 1744 had a fan-shaped tail, showing six radiations, each 4° in breadth according to Cheseaux. The tail of the comet of 1811 was very broad. Donati's comet of 1858 and the large comets of 1861, 1874, and 1881 also had tails more or less broad and divergent, thus differing materially from the fine comets of 1680, 1843, 1880, and 1887.

Swift's Comet (1889 V.).—While engaged in sweeping for nebula on Nov. 16, Prof. Swift discovered a faint object near the star ξ Pegasi, and observations on the following night proved it to be a comet. The orbit was computed by Mr. Searle, of Washington, from which it appears the comet passed its perihelion early in December, and there are indications that it is periodical. The comet, as observed at Bristol on Dec. 10 with powers 40 and 60 on a 10-in. reflector, was rather faint, pretty large, and there was either a faint star or nucleus in the centre of the nebulosity.

Brooks's Comet (1889 IV.).—Prof. Knopf has computed the orbit of this comet from observations on July 8, Aug. 25, and Oct. 24, and finds a period of 7·071 years. Mr. Chandler, in the 'Astronomical Journal' (No. 205), gives some important deductions he has arrived at with reference to the probable identity of this comet with Lexell's Comet of 1770. He says: "The encounter of the comet with Jupiter in 1886 effected a complete transformation in the comet's orbit. Instead of the present 7 years ellipse, it was previously moving in a large one of 27 years' period. It must have narrowly escaped being drawn into a closed orbit as a satellite of Jupiter. At the point of closest approach to Jupiter on May 20, 1886, the comet was distant from it only above 9 diameters of the planet, passing a little outside of the orbit of the third satellite. In 1779, and not before, the comet must have come so near to Jupiter as to pass under his control, and experience a radical change of orbit at the point of longitude where Lexell's comet underwent its notable disturbance in that year. Taking all the points presented into consideration, the argument for the identity of the two comets is overwhelming."

Denning's Comet.—According to the computations of Dr. Matthiessen, of Karlsruhe, the ensuing return of this comet will be an unfavourable one. He has published an ephemeris, from which we give a few positions:—

1890.	R.A. h m s	Dec. ° ′	Log. *r*.	Log. Δ.	Light.
Jan. 17	18 36 12	−24 59·6	0·2721	0·4421	0·04
Feb. 2	19 21 24	−24 21·5	0·2262	0·4007	0·06
18	20 12 50	−22 40·5	0·1735	0·3546	0·09
Mar. 6	21 11 40	−19 29·9	0·1122	0·3063	0·15
22	22 18 27	−14 19·6	0·0420	0·2615	0·25
April 7	23 33 19	− 6 51·9	9·9651	0·2287	0·41
23	0 54 42	+ 2 20·9	9·8160	0·2166	0·60
May 9	2 20 46	+11 44·5	9·8669	0·2274	0·65
25	3 47 3	+19 10·4	9·9003	0·2543	0·49

Light at discovery on Oct. 4, 1881=1.

W. F. Denning.

Selenographical Notes.

Aristoteles.—This beautiful object—one of the most striking of lunar ring-plains under a rising or a setting Sun, though under some conditions scarcely traceable as a distinct formation—offers many points of interest to the observer which are well within the reach of instruments of moderate size. The best view of the remarkable structure of the circumvallation is obtained when the Moon is about six days old, or about the time when the pointed extremity of the outermost of the eastern walls (for they consist of at least three concentric ranges) lies on the morning terminator. At this phase the whole of the interior is in darkness except a narrow strip of floor contiguous to the inner slope of the eastern border, which is traversed by the shadow of the giant peak β, some 10,000 feet high, on the western wall. The formation was well observed under these conditions on December 9, 1888, 6^h to 7^h, with a power of 284 on an $8\frac{1}{2}$-in. Calver reflector, with a view to compare it with Schmidt's representation. As Neison points out, the peculiar characteristic of Aristoteles—that which distinguishes it from all other ring-planes—is the curious series of low parallel hillocks associated with its surroundings. These were particularly well seen; those on the north-east and south trending from north-east to south-west, while a less obvious group on the north-west are directed from north-west to south-east. The almost strict parallelism of the several members of each of the two groups is especially noteworthy. In no sense can they be described as radiating hill-rows, such as are frequently met elsewhere. Viewing them under low morning illumination with a moderate power, they impress one with the idea that they must have existed as surface corrugations before Aristoteles was formed. Their connection, however, with the *glacis* and wall of this ring-plain, visible enough at suitable times under higher magnification, shows that this could not have been the case, but that they are clearly a part of the formation and probably date from the same epoch. Schmidt draws many minute craters in connection with these hill-rows. I was also able to detect several of these objects, mostly located in the shallow intervening valleys. There is a large depression of no great depth on the north wall of Aristoteles which is sufficiently prominent to figure in the maps; but it does not appear in any. On the south, beyond the parallel hill-rows, the ridges become very irregular in arrangement, forming in two or three instances enclosures like those which are so noticeable at sunrise on the south-west side of Copernicus. The object marked *f* in Neison's Map VI. is apparently one of these fortuitous combinations of ridges. Most of those who have observed Aristoteles at sunrise will have noticed a light-grey streak running from the dark interior obliquely across the brilliantly illuminated mountains which form the inner portion of the south-eastern wall. It is very narrow, and is bounded by parallel sides, which seem to be bordered by a faint penumbral

fringe. It would be interesting to know what this curious feature represents. Schmidt shows nothing in its place, neither do Mädler nor Neison. Its lineal regularity would lead one to suspect that it may be a shallow rill-like valley or a dyke consisting of material of less reflective power than the rocks which its cuts across *.

The interior of Aristoteles is a very difficult object even under a moderately high Sun, owing to the dazzling brilliancy of its surface and surroundings. This fact is perhaps sufficient to explain the manifest disagreement between existing drawings. Schmidt depicts three prominent hills and six or seven minor elevations on the south-western half of the floor, while he shows the remainder as devoid of detail of any kind. Mädler and Neison, on the other hand, draw a row of little hillocks running in a line from the north-east wall towards and beyond the centre, and nothing more. I have seen this row on several occasions and the three larger hills of Schmidt, but have never succeeded in making out the remainder of the features he represents, except a small crater near the foot of the northern wall.

Aristillus.—In a recent number of the 'English Mechanic,' Mr. T. P. Gray, F.R.A.S., of Bedford, draws and describes some interesting details which he has recently observed on the floor of this formation,—among them seven minute craterlets grouped closely together near the site of the central hills, at a place a little south of the apparent centre of the ring-plain. Soon after sunrise four of these are seen as bright spots, inclosing a dark triangular valley. At full Moon they seem to be connected by a circular light streak, which makes the whole formation resemble a crater with a broken north wall. At sunset a complete transformation occurs, and seven craterlets occupy the place of the ring and bright spots. We have here an analogue to the central objects in Atlas, Hercules, and Fracastorius, which pass through very similar changes during the course of the lunar day. Thos. Gwyn Elger.

Bedford, 1889, Dec. 19.

The Total Eclipse of Dec. 22.

Disappointment is so often the lot of the Astronomer, that if he cannot cheerfully contemplate reverses it is not from want of practice. We already know that we can no longer hope for several of the results attempted in the double expedition of Dec. 22, for Mr. Taylor was entirely prevented by bad weather from taking a single photograph. The misfortune was shared by the large American party which settled at Cape Ledo, and Prof. D. P. Todd has thus again suffered as keen a disappointment as in 1887.

* On September 9 this year, 9^h to 10^h, Mr. G. T. Davis, of Reading, noted two very similar stripes, roughly parallel to each other, traversing the inner slope of the eastern wall of Aristarchus from west to east.

From Father Perry we have not yet heard (Dec. 31, noon), and this is in one way a favourable sign. He was to wire on his return from Salut to Barbados, but if he obtained photographs they were to be developed on the spot; so that a few days' delay may mean that he was hard at work after the eclipse. If so, his results will doubtless be of considerable value in themselves, though the loss of Mr. Taylor's for comparison is to be the more deeply deplored. At the cost of possibly a day or two's delay in publication we shall endeavour to insert in the present Number any news received of Father Perry's success.

Letters have been received from each of the observers since their arrival. Father Perry had not indeed reached his station, but wrote from Barbados on Nov. 28. He had had an excellent passage, with only one rough night, and found H.M.SS. 'Comus' and 'Forward' both at anchor in the roadstead. The instruments were at once transferred to the 'Forward,' in which Mr. Rooney left at 11 A.M. on Nov. 28. This vessel was to take soundings on arrival and prepare the station. Father Perry in the 'Comus' hoped to join at Salut on Dec. 7, leaving a fortnight before the eclipse. "All are most kind and anxious to assist in every way. H.M.S. 'Tourmaline' is expected today with six midshipmen for 'Comus.' Miss Brown and Miss Jefferys have left for Trinidad."

In a letter to Mr. Common, Mr. Taylor writes from S. Paul de Loanda on Nov. 19:—

"The S.S. 'Bonny' arrived here on Nov. 16, up to time, and I write by the first mail. From Accra we went to Bonny, one of the mouths of the Niger and one of the hottest and most unhealthy spots on the coast. The temperature at night was 98° in my cabin; there was not a breath of wind, and a low mist lay all over the river. The decaying vegetation could be *tasted* in the air. We were lucky in arriving at a time when there were few mosquitoes.

"Commander Pullen in H.M.S. 'Alector' was determining the longitude and latitude of Bonny; but as he was down with fever I could not have seen him that night, and I was strongly advised not to venture into the malarious air at night. Next morning (Oct. 30) I saw him, he having recovered from his attack, and had a talk about the eclipse expedition and the coast generally. He had been telegraphing to Dr. Gill and home to know who was coming out and when, and to ask whether the 'Alector' could take me to the eclipse-station, and so let him assist in the observations. He heard I was coming out, but had not heard when. While I was with him telegrams came saying the 'Archer' had been ordered to meet me at Loanda. He seemed disappointed, and said so, at the same time telling me the 'Archer' was a good boat and the officers would probably be a very efficient set of assistants. Before leaving on the 31st we heard that he had another attack of fever, which proved his last, for the poor fellow died on Nov. 2nd and was buried on the 3rd. He looked as well as possible and was full of energy when I saw him on the Thursday afternoon, and within

forty hours he was no more. We lay in Bonny for the night of the 30th, which was as bad as the previous one—I did not sleep at all either night. Bonny is truly a fearful place; the wonder to me is not that people die, but that they contrive to live at all; there is a swamp on one side of the factories and the river-beach on the other, the whole strip of land being about 50 yards wide and half a mile long.

"From Bonny we ran to Old Calabar river, anchoring outside. . . [After touching at various other places] we ran to Banana Creek, at the mouth of the Congo. . . . . The Congo is quite unlike other parts of Africa. Instead of swamps and rank vegetation, here we have open country with hills, much resembling England. . . . . Immediately I arrived (Loanda) I saw the Consul (Mr. Bannister), and placed the matter of the instruments and Custom House in his hands; and on Monday everything was settled, and the instruments landed and placed at the Custom House until the 'Archer' arrives. The Americans have not yet arrived (Nov. 19). I have got the matter of the bases for the instruments in hand, and shall be ready in a few days to proceed south. I am at present quietly staying indoors until evening, for I had a bad attack of fever and do not wish it repeated by venturing into a sun at 135° and a shade temperature of 90°. Coast fever is simply awful.

"I am going to see the Governor tomorrow; he, too, is sick and is going home. Loanda is a splendid place to look at, but its smells are unpleasant. It stands on high ground and is comparatively free from all marshy ground near it. . . . . I am living at the English house and have been very hospitably received. The greatest interest is taken in the eclipse, and all seem anxious to do all they can to assist."

CORRESPONDENCE.

To the Editors of 'The Observatory.'

The Nebula in Andromeda.

GENTLEMEN,—

It has been said that the true structure of the great Nebula in Andromeda was for the first time exhibited in Mr. Roberts's remarkable photograph (reproduced in 'The Observatory,' No. 146).

The drawings made by Bond, in 1847, with the Harvard 15-in. refractor; by Trouvelot, in 1874, with the same instrument; and by Perry, in 1881, with an $18\frac{1}{4}$-in. silver-on-glass reflector (all given in 'Nature,' vol. xxv., June 1882, p. 341), agree well with each other, and give no hint of the structure revealed by the photograph. Trouvelot's is reproduced in Ball's 'Story of the Heavens,' and in Young's 'General Astronomy.' But the drawing of this nebula given in Arago's 'Astronomie Populaire,' 1854, vol. i., fig. 114, opposite p. 512, represents the nebula as having a

concentric, visually elliptical structure answering to that in Roberts's photograph. The drawing in Herschel's 'Outlines of Astronomy,' pl. ii., agrees with that in Arago, only that the concentric structure is not so strongly marked. It is "from a hasty sketch," probably by Herschel himself. What makes this more remarkable is that Herschel was aware of the difference between the drawings given by himself and by Bond (see p. 512). The matter seems to be deserving of investigation.

Faithfully yours,

40 Lr. Baggot St., Dublin,
1889, Dec.

M. H. Close.

The Capitol Observatory.

Gentlemen,—

The death of our late lamented Associate, Prof. Respighi, suggests a few reflections on the different way in which an historian and an astronomer regard the same site. In the year 1764, Gibbon tells us that being at the Roman Capitol and contemplating the bare-footed friars singing vespers in the temple of Jupiter (he should rather have said in a building erected by Michael Angelo on its site), he first conceived the idea of narrating the decline and fall of the city which was so long the mistress of the civilized world. Seventy-nine years afterwards, and forty-nine after Gibbon's death, Ignasio Calandrelli was contemplating the same site whilst the splendid comet of 1843 was in view, and conceived the wish to form an observatory there. It was not, however, possible to do so at that time, and Calandrelli pursued his work at Bologna. The events of 1848 enabled him to return to Rome, where Pio Nono enabled him to obtain the building necessary for his purpose. Leaving his work at Bologna to be continued by our late Associate, Lorenzo Respighi, he prosecuted his labours at the new Capitol (Campidoglio) Observatory until 1865, when failing health compelled him to desist. He died the following year, and was succeeded by Respighi, who laboured so energetically there during the last twenty-three years.

Yours faithfully,

Blackheath, 1889, Dec. 21.

W. T. Lynn.

OBSERVATORIES.

Helsingfors.—Dr. Anders Donner has published his work of the winter 1885–6, viz.: observations of comets Fabry, Barnard, and Brooks I., with a 7-inch refractor and ring-micrometer. The first-named he compared on 63 nights with stars, on three occasions observing occultations of stars by the comet; the second on 53 nights including one occultation; and the third on

5 nights,—the comparison stars being all observed afterwards on the meridian (but with what instrument is not mentioned). He detected no decrease in brightness of the stars during occultation. He gives various notes on the physical appearances of the comets; and a beautiful plate of comet Fabry, with the comet white on a dark ground, is appended. Dr. Donner notices a remarkable intensity of twilight on 1886, April 24.

Lund.—M. Engström has made a careful determination of the latitude by direct and reflection observations of various stars, finding 55° 41′ 51″·63 ±0″·05. In 1867 Bäcklund found 52″·11 from observations in the prime vertical.

The second volume of the zone observations (36° to 40° declination) has been published.

PUBLICATIONS.

Nautical Almanac for 1893.—This volume is constructed on the same lines as that for 1892. The right ascensions of standard stars have been brought up from the Greenwich Nine-Year Catalogue, 1872, although standard places depending on the ten years' observations 1877–1886 (and forming the basis of the Ten-Year Catalogue 1880, which is nearly ready for distribution) were circulated in 1888 December. It seems a pity that some table of corrections to the newer places was not appended, even if the actual tables were completed. There will be two eclipses in 1893, both of the Sun: one an important total eclipse, visible in S. America and North Africa; the other an annular eclipse, the central line of which lies in the Pacific Ocean. An erratum in the N.A. for 1892 has been discovered, viz. the omission of some phenomena of Jupiter's second satellite from Dec. 15 to Dec. 29, when the Ec. D. follows so closely on the Oc. Re. that the visibility of the satellite had apparently been overlooked. We have seen no note of the following errata in N.A. 1890:—p. 458, Sept. $13^{d}\ 12^{h}\ 50^{m}$, *for* Oc. R. *read* Ec. Re.; p. 476, Feb. 1, *for* $11^{h}\ 13^{m}$ *read* $12^{h}\ 13^{m}$.

The Total Eclipse of the Sun of Jan. 1, 1889*.—We have received a copy of the above work, which gives a summary of the observations by 154 observers, with an introduction by Prof. Holden. The portion of the introduction dealing with the diagrams

* Published by the Lick Observatory.

of the corona has already been printed in the 'Monthly Notices' for April. The actinic brilliancy of the corona and surrounding sky as deduced from Mr. Barnard's negatives is discussed, and the results compared with those obtained by Mr. W. H. Pickering in 1886. Prof. Holden draws the following conclusions:—

I. Coronal forms seem to vary periodically as sun-spots and auroræ, and the coronas of 1867, 1878, and 1889 are of the same strongly marked type.

II. The "polar" rays exist at all latitudes, but are better seen at the poles because they are there projected against the dark background of the sky and not against the equatorial extensions of the outer corona.

III. The outer corona terminated in branching forms which *suggest* the presence of streams of meteorites near the Sun, which by their reflective light and native brilliancy, due to the collisions of their individual members, *may* account for the phenomena of the outer corona.

IV. The extensions of the corona along and very near the plane of the ecliptic might seem to show that if the streams of meteorites exist they have long been integral parts of the solar system.

V. Photographs just before second and after third contact prove the corona to be a solar appendage and are fatal to the theory that any large part of the coronal forms are produced by diffraction.

VI. Mr. Keeler's spectroscopic observations show conclusively that the length of a coronal line is not always an indication of the depth of the gaseous coronal atmosphere of the Sun at that point, and hence to indicate that the true atmosphere of the Sun may be comparatively shallow.

VII. Mr. Keeler concludes that the "polar" rays are due to beams of light from brighter areas of the Sun illuminating the suspended particles of the Sun's gaseous envelopes (Prof. Holden does not subscribe to this view).

VIII. It is impossible to photograph the corona with our present plates, and a photographic search for Vulcan is hopeless.

The various reports and abstracts of observations extend over 187 pages.

The publication of the work has been delayed some months by the breaking of the chimney of the standard lamp.

Charts of the Constellations.—Some six months ago we referred (No. 147, p. 155) to 36 charts then being prepared by Mr. Arthur Cottam, F.R.A.S., extending from the pole to between 35° and 40° south declination. We have recently received a copy of the charts, and are glad to bear testimony to their excellence. There has been so much improvement in star-charts of late years, that the amateur astronomer would be puzzled to find anything to complain of on this head; for there is a series

to suit almost any special requirement. The special feature of the present set is their unusually large scale, 3° to an inch; so that they are suitable to work on small portions of the sky. The projection, too, is so easy that new objects can readily be laid down. All stars visible to the naked eye are shown, doubles marked, and variables indicated by a ring representing the maximum surrounding a disc representing the minimum. Of course, the accuracy of Mr. Cottam's work can only be fairly judged by considerable experience of the charts; the result of a casual inspection is, however, very favourable. The charts may be had rolled, on special application; but in the usual form they are singly folded and placed conveniently in a strong portfolio, 24 in. by 14 in.

Sydney.—We have received the Results of Meteorological Observations 1887, and Rain, River, and Evaporation Observations 1888, from which we are pleased to note that the number of reporting stations increased from 768 in 1886 to 862 in 1887. The volumes are practically in the same form as in previous years. Mr. Russell has also sent us several papers on Thunderstorms, &c.

Brioschi's Observations in 1821*.—In 1819–21 Brioschi made a number of observations of zenith distances of bright stars with two repeating-circles, at the Naples Observatory, the first year of which were reduced for determining the latitude, refraction, aberration, and parallax of the stars. The illness of the Director delayed further reduction; and meanwhile the method of the repeating-circle was discredited, C. A. F. Peters finally remarking that the observations had no scientific value. Several circumstances have led M. Fil. Angelitti to reexamine these observations. In the first place, the constant of aberration found by Brioschi was 20″·41, so near the accepted value as to suggest that the observations might be worth rediscussion; secondly, Brioschi's latitude, 40° 51′ 46″·63, differs from that found by Prof. Fergola (45″·41) by more than 1″, though a new reduction of Brioschi's observations by Nobile gave 45″·70; it was therefore a matter of interest to determine whether the latitude could have changed, or whether Brioschi's reduction was to be discredited. M. Angelitti has investigated the matter with considerable care and skill, and presented his work in a manner which leaves nothing to be desired.

He has not further reduced the observations of 1819, but has taken the year 1821, which had not yet been touched. He finds

* "Distanze zenitali circummeridiane di alcune stelle principali osservate nell' ano 1821 dall' astronomo Carlo Brioschi, allora Direttore del R. Osservatorio di Capodimonte," Mem. let. all' Acc. Pontaniana dal dottor Filippo Angelitti.

that the observations are affected with some systematic error of annual period, which renders them useless for parallax.

For the constant of aberration, however, the errors compensate, so that a good value is deduced. The discrepancy in latitude is due to the use by Brioschi of his own constant of refraction, which differs from Bessel's. If Bessel's refractions be used, the latitudes found in the years 1819 and 1821 both agree sensibly with other determinations, and there is thus a strong presumption that the latitude has not changed. Curiously enough, Bessel's refractions do not suit the observations of individual stars either in 1819 or 1821, while Brioschi's refractions will suit both years; but it is not the first time there has been trouble with refractions.

M. Angelitti's chief anxiety has been to appeal on behalf of his compatriot against the contemptuous remarks of Prof. Peters; we cannot but think that the strongest point in favour of the cause is that it should have inspired so excellent an advocate.

Bibliography of Geodesy*.—In 1885, Mr. J. H. Gore commenced preparing a History of Geodesy, and soon found difficulties arising from the want of a bibliography, which he promptly undertook to satisfy. Some idea of the labour involved in this project may be gathered from the statement that the author searched every library in Washington, and "during two trips to Europe exhausted every library facility there," and also sent circulars to all mathematicians whose addresses could be obtained. The object of the work is to give as much of the title of a book as will enable a reader to obtain it from any library possessing it with a minimum of effort. In addition to the arrangement in alphabetical order of authors, a complete list of works is given under the most important subjects. Recognitions of Mr. Gore's heavy work which will reach him cannot but be few; but he may rest assured of the gratitude of all workers in this field.

NOTES.

The Peters-Borst Star-Catalogue Case.—It is not often in the annals of Astronomy that a lawsuit occurs at all, and we sincerely hope that a lawsuit terminating in such a decision as has recently been given will never occur again in those or any other annals. Some time ago we briefly referred to the grounds of the action brought by Prof. C. A. F. Peters against Mr. C. A. Borst, and we may here recall the following facts. Prof. Peters had for

* A Bibliography of Geodesy. By J. H. Gore, B.Sc., Ph.D. Appendix 16 to U.S. Coast Survey Report, 1887.

some time intended to compile a Catalogue from various sources, but, finding he had not the leisure, suggested the undertaking to Mr. Borst, who was working at the same observatory. Mr. Borst entered into the project with enthusiasm; with the help of his sisters, who worked laboriously for two or three years, and with only the most trivial assistance from Prof. Peters, he completed the Catalogue. On the question of publication arising, he modestly suggested to Prof. Peters that the actual computation, which he had really done, should be attributed to him on the titlepage. He asked no remuneration for his services and those of his sisters, nor did he suggest that Prof. Peters's name should in any way be replaced as editor of the Catalogue. Prof. Peters's reply to this very reasonable request will be a lasting disgrace to him. He rejected the proposal with contempt and demanded unconditional surrender of the whole manuscript, which he claimed that his original trivial suggestion had made entirely his own. Mr. Borst refused to recognize this claim, which was thereupon made in a court of law; and to the consternation of astronomers, and (we are glad to see from several press criticisms) the indignation of the public, Prof. Peters's claim has been confirmed, and, by way of adding injury to insult, Mr. Borst has been condemned to pay interest on the value of the MSS., assessed according to the magnitude of his own labour, and not according to the value of the above "suggestion," from the time of refusal to surrender. These are plain facts; if coloured at all the same colouring occurs in all the accounts of the trial which we have seen, as well as in an eloquent letter from Prof. Simon Newcomb to the 'Utica Herald.' This letter is especially valuable as coming not only from an eminent, but from one who declares himself to be an "employing" astronomer, and who should know the exact relations between professor and assistant in America. He says:—"At Harvard, at the Johns Hopkins University, and, I suppose, at all the leading colleges and active observatories, there are young graduates who remain at the institution to perfect themselves in their chosen science and show what they can do by working under direction of their professors. They generally receive a small salary. The professor suggests pieces of work to be undertaken, gives them the benefit of his supervision, and criticizes their performances. When any thing is done the professor advises them whether to publish it. All this is one of the recognized objects for which institutions of learning are founded and for which professors are paid. It is evident that the defendant supposed that these were his relations to his chief, and acted accordingly, until he found that the chief was determined to claim his work as his own. From this point of view the attempts of the prosecution to show that defendant was only a hired hack, swinging the telescope and turning the dome for his employer at $50 a month, are painful to contemplate. I see but one light in which the decision can be viewed with favour, and that is in the prospect it offers to any eminent but impecunious astro-

nomer to make a lawful if not an honest living with little labour. His persuasive powers must be such that he can interest a few bright young ladies in his work, and induce them to go through his long and laborious calculations. When the work is done he must pick a quarrel with his assistants, and so anger them that they will refuse to give up their work on any terms or conditions whatever. Then he must sue them before any court where Justice Williams's law is accepted. Following strictly the line of argument in the decision before us, the court must find that plaintiff conceived the idea of the work, showed the defendants how to do it, and supervised it with rare professional skill, and that both parties had admitted it to be his. It must therefore belong to him. Following the logic of the law to its grim conclusion, the court would then assess damages in some such fashion as this. From the size of this pile of MS. it is evident that Miss Blank worked industriously, and the value of her productions may be estimated at four dollars a day. She was at work say two years, or 600 working days. Value of the result $2,400. The most moderate assessment possible will be interest on this value at 6 per cent., amounting to $144 per annum. Now if the persuasive powers of the astronomer were sufficient to secure the enlistment of a sufficient number of young ladies, he could make a comfortable living out of this source of income when all other means failed."

Brazilian Honours for Astronomers.—The last official documents signed by the ex-Emperor of Brazil were diplomas conferring on Admiral Mouchez and MM. Janssen and Perrotin the grade of Officer of the Order of the Rose of Brazil, and on MM. Frassenet and the Brothers Henry Knighthood of the same order.

Saturn's Satellites.—The following are the corrections necessary to reduce the times of East Elongation given in the 'Companion' 1890 to Mr. Marth's ephemeris in the M. N. R.A.S. :—

	Mimas. h	Enceladus. h	Tethys. h	Dione. h	Rhea. h
Jan.	−3·6	0·0	+0·1	+0·3	+0·2
Feb.	−3·5	+0·1	+0·2	+0·4	+0·4
Mar.	−3·4	+0·1	+0·3	+0·5	+0·5
Apr.	−3·4	+0·2	+0·3	+0·6	+0·7
May	−3·3	+0·3	+0·4	+0·7	+0·8
June	....	+0·4			

Elements of Comet 1886 IX. (Barnard-Hartwig).—Herr Carl Buschbaum of Göttingen has discussed the orbit of this naked-eye

comet in a thorough manner. He has collected 323 observations, 319 of which extend from 1886 October 5 to 1887 Jan. 13; and the remaining 4 were made after a three months' interval by Finlay at the Cape in April, May, and June, 1887, the comet having meanwhile been too near the Sun. Herr Buschbaum compares these observations with a provisional orbit; and from the residuals obtains 10 normal places for correction, the last 3 of which depend on the Cape observations. Weighting these according to the number and character of observations, and solving by least squares in the ordinary way, no very satisfactory result can be found, either for parabolic or other orbit. But leaving aside the Cape observations, the others will determine very accurately all the elements except the eccentricity, which may be assumed unity for the moment. The Cape observations will give the eccentricity, having been made later when the shape of the orbit was more fully declared; but for this purpose they must be given more weight than the mere number of observations would warrant. Accordingly the same weight is now given to each normal, and the orbit is found to be hyperbolic, $e=1{\cdot}0004$. The definitive elements found should be valuable.

It is unfortunate that there are a considerable number of misprints in the paper; one of them (which we cannot quite identify) makes the remarks on p. 43 about 1887, Jan. 4 (Dresden), unintelligible. We cannot agree with the principles employed in the weighting of individual observations; but this is not a matter of importance when there are so many.

Comet 1862 III.—Herr Fr. Hayn has re-discussed the observations of this comet, and obtained elliptic elements with a period of about 120 years, not very different from Oppolzer's result. The material consists of 75 meridian and a large number of equatorial observations from July to October 1862. The period of the Perseids, with which this comet has an apparent connection, is about 108 years.

A Simple Double-star Micrometer.—A pretty dark-field micrometer has been devised by Mr. A. B. Biggs, of Tasmania. He describes it as follows:—

"If a strip of glass (A), coated with black paint and having two fine converging lines cut through the paint at an angle of 10° or 15°, be placed face to face with another piece of glass (B), similarly coated and having a single line ruled across it—this line being placed so as to cross the lines of A—the intersection of the lines will show as luminous points by transmitted light. On sliding the slip A along, these points will recede or approach until they coalesce at the point of the angle. Now, if an image of these points can be projected into the field of the telescope and brought into juxta-

position with the pair of objects whose angular distance is to be measured, we obviously have the means, by a proper adjustment of the points as to distance and parallelism, of determining the measurement required. The position of the slide A is read upon a graduated scale, the value of which is determined by well-known astronomical methods.

"The projection of the image into the telescope is effected by means of an adjustable camera-lucida, constructed from a selected micro. cover-glass and attached to the eyepiece. The whole carrying-arrangement of the glass plates is made to revolve in a suitable frame, so that the luminous points may be brought into parallelism with the pair of stars to be measured, and the angle read off from a graduated circle on the rim, the zero-point being first ascertained by revolving the scale until a star shall run along the single line of plate B. The difference of readings will give the position-angle with reference to the meridian, it being supposed that the telescope is mounted equatorially."

The principle is thoroughly good and, we should imagine, capable of development. Measures made on α Centauri show that the micrometer works well in practice: the ultimate observation to be made, that of appreciating the regularity in a parallelogram formed by the two real stars and the two artificial, can be made with great nicety.

Comet *g* 1889 was discovered by M. Borrelly (Marseilles) at $7^h\ 49^m{\cdot}5$ on Dec. 12.

Ephemeris for Berlin Midnight*.

1890.	R.A. h m s	Decl. ° ′	Log *r*.	Log Δ.
Jan. 4....	18 31 40	+21 36·2	9·8562	9·9438
8....	35 45	15 22·9	9·7981	9·9346
12....	40 25	8 20·5	9·7303	9·9281
16....	46 40	+ 0 19·7	9·6514	9·9269
20....	18 56 31	− 8 42·1	9·5634	9·9344

The Newall Telescope Syndicate have recommended to the University of Cambridge that the instrument offered by Mr. Newall be accepted; that a sum of £2200 be spent on its installation near the present Observatory, and an Observer appointed at £250 per annum to devote himself to research in Stellar Physics, under the general direction of the Director of the Observatory.

We regret to notice the death, on Dec. 10, of Prof. Lorenzo Respighi, Director of the Osservatorio Campidoglio, Rome.

* Ast. Nach. No. 2943

We beg to acknowledge the receipt of two guineas from Miss A. M. Clerke on behalf of the widow of the late W. Tempel.

We hear that Dr. Raoul Gautier has succeeded his father, Col. Emile Gautier, as Director of the Geneva Observatory, having been appointed to the Chair of Astronomy at the University.

There are rumours that a Gold Medal has been awarded to Mr. Norman Lockyer by his admirers in France.

The Total Eclipse of Dec. 22.

After some delay, which caused considerable anxiety, the fears of Father Perry's friends have been confirmed in only too melancholy a manner by the news of his death, from dysentery, on Dec. 27. His work on the occasion of the eclipse was successful as far as moderate weather permitted; but the expedition has cost us an enthusiastic and thoroughly capable astronomer, and a man dearly loved by his friends. The double expedition sent by the Royal Astronomical Society has thus culminated in disaster. In Africa bad weather prevented observations, and at the other end of the line, off the coast of French Guiana, observations were secured at the expense of the observer's life. The actual telegram received from Demerara was as follows:—"104 Corona American Perry dead dysentery." The last three words need no further explanation. As regards the first, 104 is resolvable into the factors 2, 4, and 13; of which the first number means that the weather was only moderately good, the second that successful exposures were made with the Abney 4-inch lens, but that the development was not carried out, owing either to unfavourable climatic conditions or possibly to the illness of Father Perry; and the third that successful photographs were obtained with the 20-inch mirror, but again the development was not completed. The words "Corona American" signify most probably that the corona was of the same form as that seen on 1889 January 1, when a total eclipse was successfully observed in California; and the form was then that now generally ascribed to a period of minimum sun-spots elongated at the Sun's equator and radial, but short, at the poles.

Father Perry has been one of the most consistent and cheerful of sufferers in the cause of science; he was always a martyr to sea-sickness, but has been a member of more astronomical expeditions than any man now living. His sacrifices have now culminated in his death; and he is a man that can be ill-spared. The work on the Sun which he inaugurated and superintended at Stonyhurst was of first-rate excellence; and the description of it which he recently gave at the Royal Institution will be fresh in the minds of many. He was just starting systematic spectroscopic work on sun-spots, which would have been also of the greatest value, and which we hope will still be carried out. But it is unquestionable that the loss of his guiding hand will be sorely felt.