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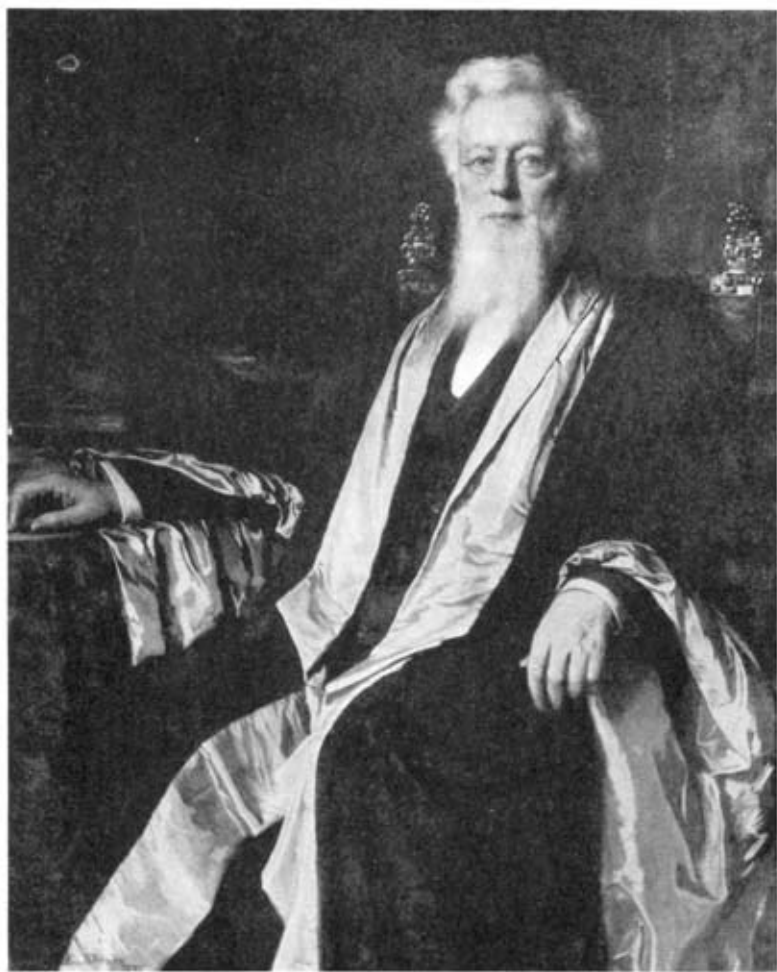
FREDERICK AUGUSTUS PORTER
BARNARD

1809–1889

BY

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There have been enough cases of brothers and fathers and sons elected to the National Academy of Sciences to support the view of hereditary genius. Besides Agassiz, Bailey, Dana, Draper, Lyman, Mayer (Mayor), Mendenhall, Silliman, Van Vleck, fathers and sons; there have been elected the brothers Hilgard, LeConte, Whitney and Compton. One of the striking cases is that of the Barnard brothers, John G. Barnard, one of the incorporators of the Academy,* and Frederick Augustus Porter Barnard also an incorporator, subject of the present memoir. John was engineer and mathematician; Frederick administrator and mathematician.

These brothers are stars of a famous galaxy. Their father, Robert F. Barnard of Sheffield, Massachusetts, was a lawyer of marked ability who was several times state senator. His father in turn was a physician, and a generation or two back we have military men and a physician. The mother of these brothers was Augusta Porter. Through her side of the house there were half cousins (1) Henry Porter Andrews (b. 1822) who was a civil engineer attached to the Engineer Corps, U. S. A., and helped John G. Barnard in his survey of the isthmus of Tehuantepec. He helped fortify the "Golden Gate" and New York harbor defenses, and was paymaster of the army throughout the Civil War. Also, (2) Henry C. Walton, graduated from Columbia School of Mines, a metallurgist of distinction.

* Of John Gross Barnard the Academy has published a biography. Born 1815, he studied at West Point, graduated second in a class of 43. He erected fortifications at Pensacola and New Orleans, was principal engineer in war with Mexico, superintended the defense at Tampico and battlefields about Mexico. He was chief of the survey of the isthmus of Tehuantepec for a route to the Pacific ocean; Superintendent of U. S. Military Academy 1855-56, and a leading engineer in the army during the Civil War.

His biographer states that he was "modest and retiring in disposition, considerate and courteous, warm in his sympathies, and his name will be cherished with peculiar love and affection by his brother officers. He had a keen sense of humor and a passionate love of music."

Of the brothers of the mother's father Joshua Porter was a surgeon in the Continental Army and first president of Saratoga Springs village; his nephew was a state senator in Connecticut. A brother of Joshua, Augustus Porter, was a land surveyor and had a son who became United States Senator. Another brother of Joshua was a Member of Congress before the war of 1812, became brevet major general in the war, and was Secretary of War in President Madison's cabinet. His son, Captain Peter, was killed in action in the Civil War. Others of this galaxy might be cited who were distinguished chemists, metallurgists and warriors.

Into a less desirable heritage the Barnards were born. There was hardness of hearing (otosclerosis) on the mother's side. She was affected and both of her sons.

Such was the family background of Frederick, born at Sheffield, Massachusetts, on May 5, 1809. His education was somewhat incidental till he attended Saratoga Academy while living with his mother's father at Saratoga Springs. After further schooling at Stockbridge he entered Yale College, 1824, and was graduated in 1828, standing second in the honor list.

After two years of teaching at Hartford, Frederick was called to Yale College as tutor. At that time each sub-senior class was divided into groups each of which recited all lessons to one tutor. Barnard inaugurated the reform of having tutors for each special subject. His was mathematics.

Growing deafness led him to accept a tutorship (May, 1831) at a Hartford school for deaf mutes and a year later at the New York Institution for the Deaf and Dumb. While at the latter institution he published an Analytical Grammar (1836) intended for the deaf, and prepared a paper on the aurora. In 1837 he was elected professor of mathematics and natural philosophy at the University of Alabama, and continued there for seventeen years, the last six as professor of chemistry. In 1854 he was called to the chair of astronomy and mathematics at the University of Mississippi at Oxford. Two years later he was elected to the office of President, later changed to Chancellor. At Alabama he built and furnished a small astronomical observatory and suspended a Foucault pendulum from a dome by a ninety-

foot piano wire. He invented stereoscopic photography. He took up journalism, sometimes writing political editorials for the two newspapers of opposed principles, and on occasion refuting his own editorials. He served as a commissioner to relocate the boundary between Florida and Alabama. He took a leading part in discussions as to university policy. In 1854 he received orders in the Episcopal church.

At Oxford, Barnard built up a strong institution, secured the erection of astronomical and magnetic observatories and ordered a nineteen-inch lens from Clark of Cambridge; but as this was not completed before the Civil War was declared it was never delivered to the University of Mississippi, but to the Dearborn Observatory at Chicago.

In 1860 Barnard accepted an invitation of A. D. Bache to accompany a total eclipse expedition to Labrador. He returned to Newport, R. I., to find that he had been elected president of the American Association for the Advancement of Science. On account of the war the next meeting was not held until 1866, so that Barnard holds the record for length of office of president of the Association.

Barnard was a northerner, though a slaveholder, caught in the South at the outbreak of secession, of which he disapproved. Almost all the students entered military service and he resigned his office as Chancellor. The trustees of the University begged him to withdraw his resignation, which he did conditional upon the reopening of the University in the autumn. Such reopening did not take place so Barnard left with the good will of the trustees and a commission to report to them on military schools in South Carolina and Virginia. He made the report in person. President Jefferson Davis of the Confederacy personally urged him to stay in the South as he was needed to direct the work of obtaining sulphur from the mines of western Tennessee, but he declined and went with his wife to live at Norfolk, Virginia, until that city was captured by Federal troops in May, 1862.

Coming to Washington he was given direction of the map and chart department of the Coast Survey under A. D. Bache. This included the preparation and publication of war maps. While thus engaged he published his famous "Letter to the President

of the United States by a Refugee," which denounced slavery, the "giant conspiracy" of southern leaders and especially the work of northern Copperheads as the greatest danger faced by the Republic. Shortly after this letter appeared Barnard was elected tenth President of Columbia College, in 1864, at the age of fifty-five.

Barnard entered upon his work with energy and tact. He had to revive a feeble School of Mines. In his inaugural address, at a time when the conflict between science and religion was being much discussed, he took for his topic the real absence of such a conflict. As a priest and a man of science he sought to harmonize the two camps.

During the years of his presidency Barnard adhered closely to his duties of building the college into a university. He was appointed by the President of the United States on a government commission to the Paris Exposition of 1867 and to the exposition at Vienna, at both of which he was on a committee on instruments of precision. He made four other summer trips abroad, being everywhere received as a distinguished American citizen.

In the field of education he took a pleading part. As President Butler says: *

"Among the new visions which President Barnard had during his quarter century of service as administrative head of Columbia College were: the elective system of undergraduate study and the enriching of the undergraduate curriculum; the reform of the examination system; the emphasis which should be placed upon the study of modern European languages; the building of a university organization after the fashion of those of continental Europe upon the foundation of the undergraduate college; the provision of opportunities for the higher education of women, equal in all respects to those provided for men, this to be accomplished either through co-instruction of young men and young women in the same institution or by the establishment of separate colleges for women; the study of education as a science and the development of a plan for the professional training of teachers which should take its place side by side with plans already existing for the professional training of lawyers and physicians; and finally, the larger service of college and university to the general public which has since found expression in University Extension, in Home Study, and in various other forms of carrying the fruits of contemporary scholar-

* The Rise of a University. Vol. I. Columbia Univ. Press. 1937.

ship to great companies of eager men and women who are no longer formal students at any institution."

As President of the College Barnard issued annual reports in which he set forth his views of education in general and the achievements and needs of the College. These writings have been republished in "The Rise of a University" (Vol. 1, 1937), by the Columbia University Press. They cover the whole field of education. As a man of science he early (1879) called for the need of provision of graduate instruction. It seems remarkable to us today that in 1882 the biological sciences were "all unrepresented in our scheme of instruction" at Columbia. He early urged that Columbia should follow Harvard in the adoption of the elective system, but he later came to see that undergraduates would be aided in choice of electives by the advice of a member of the faculty.

In May, 1888, Barnard presented to the Trustees of Columbia College his resignation as President. He was now in his eightieth year and his health unstable. These facts led to the acceptance of his request. He lived less than a year longer, dying April 27, 1889. In his will, being childless, he left a fund to the College for "encouraging scientific research." Also a fund for the increase of the library. He made provision for a gold medal to be awarded every five years to the person who shall "have made such discovery in physical or astronomical science or such novel application of science to purposes beneficial to the human race as, in the judgment of the National Academy of Sciences of the United States, shall be esteemed most worthy of such honor." Among recipients of this medal have been Niels Bohr, Sir William Henry Bragg, jointly with his son William L. Bragg, Albert Einstein, Warner Heisenberg, Edwin Hubble, Ernest Baron Rutherford.

Frederick Barnard, a scion of a family of professional men, lawyers, statesmen, physicians, military men, chemists, engineers and mathematicians, originally trained for the law, was led, on account of a family defect in hearing, into teaching and administration. He maintained chemical and astronomical research as an avocation.

Barnard was about six feet tall and in his later years grew a long white beard and reminded one of his former students of the conventional pictures of Moses. From youth he was gay in disposition and had an attractive personality. When in Hartford he arranged to go to a concert with some of Miss Beecher's girls when they should have attended one of her "exhibitions"; but the plot was discovered in time to foil it. From an early age he showed a somewhat non-plastic disposition. Thus when at school the tutor called him to account for some offence that Barnard did not regard as such, and demanded an apology, the boy refused and was publicly censured before the whole school. The Board of Trustees of the University of Alabama had voted unanimously a certain plan for instruction, Barnard wrote a full report opposing that plan and gained a partial victory. In later life at Columbia College he showed an intolerance of opposition and a certain imperiousness of manner. He had something of the warrior traits that were part of the family heritage.

Barnard wrote easily. He wrote many pieces of poetry, edited papers while at the University of Alabama and contributed to a literary journal. His exhaustive report on a proposition to modify the plan of instruction in the University of Alabama was written, while still busy with his usual college work, within six days. At his inauguration as Chancellor at Mississippi he wrote a long "Open Letter" to the Board of Trustees, urging scientific studies. His "Letter to the President of the United States" was an effective if somewhat exaggerated statement. His annual reports at Columbia were distinguished by fullness and clarity and had an immense influence. From 1873 to 1877 he was engaged in heavy literary work as Editor in Chief of Johnson's *Cyclopedia* containing 7,000 closely-printed pages; for which he wrote many important articles. In his last year he wrote much autobiographical material.

In speech he was equally a master of words. As a recent college graduate he made a Fourth of July speech. In 1851 at Alabama he again delivered a public oration; for "his eloquence was universally admired."

Barnard had variable moods. At twenty years while teaching, he would sit for a half hour at a time with his head bowed on

his desk, and his gloom was deepened by the incidence of deafness. At other times his gaiety was extreme.

Of him President Nicholas Murray Butler says :

"His activities were gravely limited and conditioned by his very severe deafness. In his office, he had standing on his desk a large wooden sound receiver, perhaps two feet square, into which one spoke when conversing with him. When himself speaking, his voice was naturally affected by his deafness and was neither clear nor pleasant. On the other hand, he had great charm of personality, manifested by his facial expression, by the character and cordiality of his speech and by his generous and kindly interest in those with whom he was associated.

"As a matter of fact, I owe to Dr. Barnard not only the choice of my career, but the determination to stick to it despite every sort and kind of temptation, whether financial or political."

Professor James C. Egbert of Columbia writes :

"I remember him very well indeed. He was a tall man with a long gray beard, very reverend in appearance, very dignified. I remember well how he conducted the commencement exercises, speaking most distinctly and appropriately. He was very deaf, and his desk was fitted up with a sort of amplifier through which the person who was calling upon him was compelled to speak. This was very awkward when one was particularly anxious to make an impression on him. I do not think that he was a man of ready temper ; I should say that he was placid and not easily provoked. As I have suggested above, he had a most dignified bearing, especially in the presence of the students. Those who were interested in their work were always received readily by the President. I remember very well the letter which he wrote for me when I was thinking of seeking a position as a teacher. He was most kindly and fair in this statement, the sort of letter of recommendation which would have satisfactory effect. You will see that these statements which I have given are personal and indicate the impression which President Barnard made upon me. Many of us feel that President Barnard was most progressive in education and really had foresight as to the sort of institution Columbia should become and could become."

The following extract from the minutes of the Alumni of Columbia University give a contemporary estimate of President Barnard :

"In 1864 at the date of Doctor Barnard's accession to the presidency, the College was at a critical period of its history. It was ready for development and had begun to develop. The Law School had been established a few years previously and was in successful operation. The School of Mines was in process of organization. The Trustees had for several years

been considering the expansion of the undergraduate course, and in connection therewith a system of university education. At this critical period the College happily obtained as its chief counsellor and guide Dr. Barnard, a profound student of education, in sympathy with all the forms of higher development, literary as well as scientific, of quick perception, peculiarly open to new ideas and prolific of them, of learning deep, exact, and extensive in many fields, a classical and English scholar, a fine mathematician, physicist, chemist, and adding to his severer accomplishments that of being a poet and a musician of no mean quality, a prolific, elegant, and persuasive writer, a logical and convincing speaker, of sanguine enthusiastic temperament, bold and persistent in the advocacy of his opinions, and impervious to discouragement. He quickened into organic life the School of Mines, he gave vitalizing force to the extension and liberalization of the undergraduate course, to the founding of fellowships for the encouragement and assistance in their higher studies of earnest and able young men, to the extension of the library and the liberalization of its management, to the project of a course for the higher study of political and historical subjects, and to the scheme for a broad and liberal system of post-graduate or university instruction, which the College had long but vainly desired. In brief, he gave Columbia College a new life and a new significance, and by his commanding position in many learned societies, by the force and elegance of his published writings, scientific, literary, legal, political, educational, and by his wide acquaintance with the foremost men of his time, he attracted attention to the College, and did much to interest the community at large in it.

Age could not wither nor custom stale
His infinite variety.

He possessed, with such men as Gladstone and Bismarck (it is a very rare quality) the fervor in age that he had in youth, and was as ready as he was before he had secured position and fame, to take up a new idea, a new project, and pursue it with as much vigor as if a long life were still before him, and all his reputation yet to make. It was this quality that made him a great president to the very last. With almost his latest breath, unable to write, and speaking with difficulty, he dictated letters of counsel upon what was ever nearest his great heart—Columbia College and her future."

His scientific work was an avocation. On present day standards he might be regarded as a very gifted man whose other interests left him little time for fundamental work in science, although in photography his use of chlorine gas and invention of stereoscopic photography were real achievements. His knowledge and accuracy in using the sextant made him indispensable in locating the correct state boundary line. Again, in the Coast

Survey his work in preparing war maps required accuracy. He was in his day the foremost propagandist for the metric system in the United States. His analysis of the theory of magic squares reveals his hereditary mathematical genius. The examination of his bibliography, appended to this paper, gives the best idea of his scientific productiveness.

Barnard adapted himself well to any situation in which he found himself. While in the South there is no evidence that he entertained any strong feelings on slavery. Says Fulton, "He was not a man whose feelings governed his convictions." He accepted slavery as an unwelcome fact; and of his own will he became a slaveholder. After knowing him twenty years two southern gentlemen testified that they "had never heard his attachment to the institutions of the South called in question." He himself stated to his board, "I am a slaveholder and, if I know myself, I am sound on the slavery question." Yet after he had passed the war barrier and was safe in Washington, in the circle of abolitionist friends, he denounced "that relic of primeval barbarism, that loathsome monument to the brutalities of the ages of darkness, that monster injustice—cursed of Christian men and hated of God—domestic slavery."

The outstanding traits of Barnard, those that made him great, were the broad sweep of his imagination and his vision of the future, combined with the special gifts of administration and others that might have made him a noteworthy engineer. These, together with his capacity for making and holding friends and commanding support for his ideas, made him one of the great builders in the field of education.

SCIENTIFIC BIBLIOGRAPHY OF F. A. P. BARNARD

President Barnard's interests were wide. As clergyman, educationalist, pamphleteer and man of science, he wrote many magazine articles of a general nature and annual reports as President of Columbia University and gave many addresses (afterwards printed) which are not included in this bibliography. A complete bibliography has been compiled by Columbia University, New York City.

1830

A treatise on arithmetic. Hartford, Packard and Butler. 288 pp.

1831

Advertisement. In Bewick Bridge. A treatise on the construction, properties, and analogies of the three conic sections. New Haven, H. Howe.

1834

Education of the deaf and dumb. N. Amer. Rev., Apr., 38, pp. 307-357.

1836

Analytic grammar; with symbolic illustration. New York, E. French. 264 pp.

1838

On the Aurora Borealis of 14 Nov. 1837. Amer. Journ. Sci., 34, pp. 267-290.

1841

Improvement in the Daguerreotype process of photography. Amer. Journ. Sci., 41, pp. 352-354.

1844

Instruction of the deaf and dumb. N. Amer. Rev., Oct., 59, pp. 329-352.

1853

Theoretic determination of the expenditure of heat in the hot air engine. Amer. Journ. Sci., 2d ser. 16, pp. 218-227, 293, 351-357, 431-432.

Proposed modification of the construction of the Ericsson engine, with a view to increase its available power. Amer. Journ. Sci., 2d ser. 16, pp. 232-250.

Method of taking Daguerreotype pictures for the stereoscope, simultaneously, upon the same plate, with an ordinary camera. Amer. Journ. Sci., 16, pp. 348-350.

1854

On the elastic force of heated air, considered as a motive power. Amer. Journ. Sci., 2d ser. 17, pp. 153-168.

On the comparative expenditure of heat in different forms of the air-engine. Amer. Journ. Sci., 2d ser. 18, pp. 160-176.

Mechanical action of heat. Amer. Journ. Sci., 2d ser. 18, pp. 300-301.

1855

Improvement practicable in American colleges. A paper read before the American Association for the Advancement of Education, at its fifth annual session, in the chapel of the University of New York, on the 30th of August. Hartford, F. C. Brownell. 30 pp.

1856

On the theory which attributes the Zodiacal Light to a nebulous ring surrounding the earth. Amer. Journ. Sci., 2d ser. 21, pp. 217-237. 399-401.

1858

Report on the history and progress of the American coast survey, up to the year 1858. By the committee of twenty appointed by the American Association for the Advancement of Science, at the Montreal meeting. August, 1857. Cambridge, 1858. 126 pp.

1859

On the means of preventing the alteration of metallic surfaces employed to close and break a voltaic circuit. Amer. Assoc. Proc., pp. 208-215.
On the pendulum: with a description of an electric clock, constructed by E. S. Ritchie. Amer. Journ. Sci., 2d ser. 27, pp. 184-197.

1860

Notice of the astronomical expedition to Cape Chudleigh (or Chidley), Labrador. Amer. Journ. Sci., 2d ser. 30, pp. 281-285.

1862

Lectures on the undulatory theory of light. Annual Report Smithsonian Inst. pp. 107-239. Diags.

1863

Letter to the President of the United States, by a refugee. Philadelphia. J. B. Lippincott. 32 pp.
Hydraulics of the report on the Mississippi River of Capt. Humphreys and Lieut. Abbot. Amer. Journ. Sci., 2d ser. 36, pp. 16-37, 197-212.
On the explosive force of gunpowder. Amer. Journ. Sci., 2d ser. 36, pp. 241-256.

1865

Inaugural Discourse. In proceedings at the inauguration of Frederick A. P. Barnard, S.T.D., LL.D., as president of Columbia College, on Monday, October 3, 1864. New York. pp. 43-79.

1869

Machinery and processes of the industrial arts, and apparatus of the exact sciences. Report as U. S. Commissioner to the Paris Universal Exposition, 1867. Washington, Govt. Print. Off., 9, 146 pp. Diags.

1871

- The metric system of weights and measures. Proc. of University Convocation. Albany, pp. 585-691.
- A new form of binocular for use with high powers of the microscope. Read before the Microscopical Section of the American Association for the Advancement of Science, at the Troy meeting, 1871. Amer. Naturalist. Jan. vol. 4. 7 pp.
- Improvement of American colleges. Columbia College: Elective studies. Amer. Journ. Education. 22, pp. 435-52.
- The examination of Nobert's nineteenth band. Monthly Microscopical Journ. 6, pp. 194-198.

1872

- Report on the principles which should govern the tolerance of deviations from standard weight of coins weighed in parcels; made to the Secretary of the Treasury of the U. S. at the request of the Commission of 1872 for the scrutiny of the coinage. Washington, Govt. Print. Off. 18 pp. Tables.
- A few additional remarks on "The examination of Nobert's nineteenth band". Monthly Microscopical Journ. 7, pp. 119-122.
- Money. *In* David Dudley Field, Outlines of an International Code. New York, pp. 281-296.
- Weights and measures. *In* David Dudley Field, Outlines of an International Code. New York, pp. 297-349.
- Longitude and time. *In* David Dudley Field, Outlines of an International Code. New York, pp. 350-361.
- Sea Signals. *In* David Dudley Field, Outlines of an International Code. New York, pp. 362-366.
- The metric system of weights and measures; an address delivered before the convocation of the University of the State of New York, Albany, Aug. 1, 1871. New York, Columbia College, 194 pp.

1874

- International coinage. London, William Clowes and Sons. 8 pp.
- Johnson's new universal cyclopaedia. Editors-in-chief, F. A. P. Barnard and Arnold Guyot. New York, A. J. Johnson, 3 vol.

1876

- Theory of Magic Squares. Nat. Acad. Sci., April.
- Magic Squares. New York, Johnson's Cyclopaedia, vol. iii.

1870

- The possibility of an invariable standard of value. Proc. Amer. Metrological Soc. Dec.
- The metric system of weights and measures; an address delivered before the convocation of the University of the State of New York, Albany.

FREDERICK AUGUSTUS PORTER BARNARD—DAVENPORT

Aug. 1, 1871. 3rd ed. with additions and index of two thousand references. Boston, Amer. Metric Bureau, 6, 456 pp. Tables.

Mono-metallism, bi-metallism and international coinage; a paper prepared for presentation to the Association for the Reform and Codification of the Law of Nations at their meeting held in the Guild Hall, London, Aug. 1879. New York, The S. W. Green Type-setting machines. 23 pp.

1880

The possibility of an invariable standard of value. Proc. Amer. Metrological Soc., vol. 2, pt. 1, pp. 65-84.

1881

Standard time. Proc. Amer. Metrological Soc. May. 14 pp.

The regulation of time; international coinage; the unification of weights and measures; sea-signals; read before the Association for the Reform and Codification of the Law of Nations, at Cologne, Aug. 1881. London, William Clowes and Sons. 16 pp.

The silver question and the international monetary conference of 1881. Princeton Rev. May, 57, pp. 342-368.

1882

Extracts from an address before the Association for the Reform and Codification of the Law of Nations, at Cologne, Aug. 1881. The regulation of time. Amer. Soc. Civil Eng. pp. 15-22.

The world's stock of the precious metals. New York, Gregory Bros. Proc. Amer. Metrological Soc., vol. 2, pt. 3, pp. 241-267.

1883

On the relation to the public welfare of changes in the volume of money and on monetary standards. Proc. Amer. Metrological Soc., vol. 2, pt. 3, pp. 202-230.

1884

The metrological system of the Great Pyramid. School of Mines Quarterly, 5, pp. 97-127, 193-217, 289-329.

The imaginary metrological system of the Great Pyramid of Gizeh. New York, J. Wiley & Sons. 106 pp.

The metrology of the Great Pyramid. Proc. Amer. Metrological Soc., vol. 4, pp. 117-219.

Pyramid metrology. The Churchman, Oct.

1888

Balance for determining specific gravities by inspection. Memoirs Natl. Acad. Sci. 4, pp. 203-206.

Theory of magic squares and of magic cubes. Memoirs Natl. Acad. Sci. 4, pp. 209-270.

Systems of weight and measure. School of Mines Quarterly, 9, pp. 193-212, 291-299.

Biography and Collected Addresses

John Fulton. 1896. *Memoirs of Frederick A. P. Barnard, D.D., LL.D., L.H.D., D.C.L.* Tenth President of Columbia College in the City of New York. New York, Macmillan. 485 pp.

William F. Russell. 1937. *The Rise of a University. The Later Days of Old Columbia College.* New York, Columbia University Press. 415 pp.

SOURCES OF INFORMATION

Besides the biographies and addresses, assistance in the compilation of this memoir was obtained from President Nicholas Murray Butler, Professor James C. Egbert, Dr. C. C. Williamson, Director of Libraries, and Mr. Milton Halsey Thomas, Curator of Columbiana, all of Columbia University, New York City.