

Chapter Four

Rutgers Scientific School (1859-1880)

Growth of Rutgers College

The Civil War began in April 1861, and a few students went off to enlist in the army. As the War continued, the enrollments in Rutgers College fell from 124 in 1861 to 64 in 1864. Although there was a substantial drop in the student enrollment, the College managed to continue its program of instruction.¹

In April 1862 President Theodore Frelinghuysen died, after twelve years as President of the College. As the next President, the Trustees selected Rev. William H. Campbell, who had been a member of the Seminary faculty since 1851. In his inaugural address, President Campbell spoke of the importance of an education that stresses thoroughness in the mastery of the assigned subjects and emphasizes Christian values. His one proposal for curricular reform was the suggestion that more time should be devoted to the study of the Bible and Hebrew.²

When Campbell became President, there were nine faculty members teaching in the College. In addition to the President, there were two theology professors, four language professors, a professor of mathematics and natural philosophy, and a professor of chemistry and natural history. By 1864 there was only one theology professor teaching in the College. In 1867 the last theology professor ceased teaching in the College, and President Campbell became the College Professor of Theology. When he resigned in 1882, there were no further appointments of College Professor of Theology.³

In 1856 the Theological Seminary moved into a new building, and in 1864 the College and Theological Seminary became separate institutions as the formal relationship between the College and the Dutch

¹McCormick, *Rutgers: A Bicentennial History*, 77.

²*Ibid.*, 82.

³*Rutgers College Catalogues, 1861-1864*; Demarest, *A History of Rutgers College*, 401, 404.

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Reformed Church came to an end. The Synod sold the Old Queen's building and campus property back to the College for a nominal sum. However, as a condition for the transfer of the property to the College, the Trustees agreed to continue to honor the provision of the College Charter that specified that the President of the College would be a member of the Dutch Reformed Church. They also agreed that three-fourths of the members of the Board of Trustees would be members of the Dutch Reformed Church, a provision not contained in the original Charter.⁴

After the Civil War, the student enrollment again increased, reaching a total of 188 students in 1875. In 1882, at the end of President Campbell's administration, the enrollment decreased again to 113. Usually the number of classical students outnumbered the number of scientific students by two to one. About half of the students were recipients of scholarships.⁵

By 1880 there were 364 colleges in the country, with an average enrollment of slightly under 100 students. In its program and facilities, Rutgers College ranked with the better colleges in the nation, but the enrollment at Rutgers experienced a slight decline. Rutgers College continued to be strongly identified with, and to look for support from, one of the smallest Protestant denominations in the country, and the State of New Jersey gave no financial support.⁶

In 1865 the new Rutgers Scientific School opened. Until that time, Rutgers had provided a predominantly classical education, although science was an important part of the curriculum. With the opening of the Scientific School, Rutgers College had two divisions, the older Classical School and the new Scientific School. Until 1868 all students in the Classical School took the same course of instruction. In 1868 Rutgers initiated a rather conservative program of electives for the students in the Classical School. In the freshman and sophomore years, all classes were still required of all students. For the first time, during the junior and senior years there were certain classes that could be elected, depending upon the interests of the students. Latin and Greek were no longer required after the sophomore year, and in each of the last two years, a

⁴Demarest, *A History of Rutgers College*, 402, 403.

⁵McCormick, *Rutgers: A Bicentennial History*, 103.

⁶*Ibid.*, 109.

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student could select one course from the following list: Latin, Greek, Astronomy, analytical chemistry, or German. There was no significant change in this elective system until 1891.⁷

During President Campbell's administration, steps were taken to begin graduate study at Rutgers. Some efforts had been made in the 1850's at other American Universities to offer formal programs leading to advanced degrees. Yale awarded the first earned American Ph.D.'s in 1861, but there was little substantial movement towards establishing graduate programs in America until Johns Hopkins was founded in 1876. At Rutgers, a few students were enrolled as graduate students as early as 1865, but it would be many years before graduate students at Rutgers College received advanced degrees. In 1876 a faculty committee recommended that the faculty be authorized to offer graduate courses. The Trustees gave their approval, with the understanding that such work should not "interfere in any degree with the efficiency of the undergraduate courses of study." No proposals were made at that time for advanced degrees.⁸

In 1876-77 the *Rutgers Catalogue* gave the first listing of the areas of postgraduate study:

1. Moral Philosophy and the Evidences of Christianity.
2. Metaphysics.
3. Geology and Chemistry.
4. Mathematics. Instruction will be given in any of the following subjects: Geodesy, with Practice, Higher Mathematics (pure); Theoretical and Practical Astronomy; the Use of Physical Apparatus.
5. Greek Language and Literature.
6. Modern Languages.
7. Political and Social Science.

Thus astronomy and physics were listed among the first graduate programs at Rutgers, although it would be many years before the first graduate degrees would be granted in these areas.⁹

⁷McCormick, *Rutgers: A Bicentennial History*, 98.

⁸*Ibid.*, 99; *Rutgers College Catalogues*, 1865-71.

⁹*Rutgers College Catalogues*, 1876-79.

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Establishment of Rutgers Scientific School

A major transformation of Rutgers College began with the establishment of the Rutgers Scientific School in 1864. There had been a number of efforts in the country to organize science programs at colleges, but none of them were very successful. Queen's College had made provision for special students as early as 1810, but there is no evidence that any students took advantage of this option. Beginning in 1841, the *Rutgers College Catalogue* contained the description of a Scientific Course, which enabled a student to select “such studies as have a direct bearing on his intended pursuits in life.” This statement continued to be listed in the *Catalogue* until 1864, when the Rutgers Scientific School was established. During the period from 1841 to 1864 there were perhaps a total of 20 or more students admitted to this Scientific Course, with as many as five students at one time. Although the program did not attract many students during this period, it was the predecessor of the Rutgers Scientific School, which was established when Rutgers became the land-grant college in 1864.¹⁰

There had been a growing body of opinion in the country that the colleges, with their classical emphasis, were not able to meet the needs of students interested in the more scientific or practical vocations. In 1819 Simeon DeWitt, graduate of the Queen's College Class of 1776, had published a paper “On the Necessity of Establishing an Agricultural College.” In the United States Congress, Senator Justin Morrill became concerned about encouraging education for scientific and practical vocations. He sponsored and secured the passage in 1862 of an act to establish this kind of education in the various states. The act provided that federal lands, in proportion to the number of United States Senators and Representatives, would be transferred to the states. The states would sell these lands, and the proceeds of the sales would provide a permanent endowment for a college or colleges in the state that would emphasize agriculture and the mechanic arts.¹¹

Princeton, Rutgers, and the State Normal School competed for the designation of land-grant college of New Jersey. At Rutgers, George Cook, Professor of Chemistry and Natural History, and David Murray,

¹⁰*Rutgers College Catalogues*; McCormick, *Rutgers: A Bicentennial History*, 62, 63.

¹¹Demarest, *A History of Rutgers College*, 405-408.

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Professor of Mathematics, Natural Philosophy, and Astronomy, prepared a plan for the establishment at Rutgers of the Land-Grant College of New Jersey. In 1864 the Trustees authorized the establishment of the Rutgers Scientific School as a part of Rutgers College. The State Legislature named the Rutgers Scientific School as the Land-Grant College of New Jersey, i.e., the New Jersey College for the Benefit of Agriculture and the Mechanic Arts. The amount of money received from the State was not very large, about \$5,800 annually. However, it made possible the appointment of new instructors in scientific subjects. Between 1864 and 1865, the number of faculty members at Rutgers College increased from nine to twelve.¹²

The Rutgers Scientific School began operation in the fall of 1865 with seven students. The following year fourteen students entered the program. There were two three-year courses of study, one in civil engineering and mechanics, and a second in chemistry and agriculture, both courses leading to a degree of Bachelor of Science. Almost all of the students followed the engineering course. It was nearly forty years before any significant number of students entered the agriculture course. Although engineering was the predominate course of study in the Rutgers Scientific School in the early years, the term "agricultural college" was widely used in referring to the Land-Grant College.¹³

In the early years of the Scientific School, all students pursued a single curriculum, which included French, German, rhetoric, history, mathematics, chemistry, physics, physiology, and geology, together with specialized courses in mechanics, engineering, and military drill. Many of the courses were taken together with the classical students. In addition to the one term of physics and chemistry taken by all students in the second year, the course in civil engineering and mechanics included one term of mechanics and one term of optics and optical instruments in the second year, and one term of astronomy and the use of astronomical instruments in the third year.¹⁴

¹²Demarest, *A History of Rutgers College*, 409-411; McCormick, *Rutgers: A Bicentennial History*, 88; *Rutgers College Catalogues*.

¹³Demarest, *A History of Rutgers College*, 405-413; McCormick, *Rutgers: A Bicentennial History*, 91; *Rutgers College Catalogue*, 1865-66.

¹⁴*Rutgers College Catalogues*, 1863-65.

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In 1871 there was an extensive revision of the Scientific School program. It was changed to a four-year program, in order to increase the effectiveness of instruction, especially in the sciences, and to make the program comparable to that of the classical curriculum. There were still two courses, one oriented toward engineering and the other toward chemistry, but the students did not elect their field of specialization until the junior year. In the final two years, the engineers studied with Professor E. A. Bowser, and the chemists studied with Professor Francis C. Van Dyck. For those who could not undertake the full four-year program, there were two-year special courses in chemistry and agriculture, which attracted very few students. This basic format remained unchanged for nearly 20 years. A total of 159 students attended the Scientific School during the first fifteen years, and 99 of these students graduated. Of the graduates, 41 followed a career in engineering.¹⁵



Figure 10 Geology Hall

With the opening of the Rutgers Scientific School there were new faculty appointments. From 1864 to 1867 there were appointments of a professor of agriculture, a professor of engineering, a professor of mining and metallurgy, and a superintendent of military instruction. With the opening of the Rutgers Scientific School there was also a need for an additional building for the expanding program. The removal of the theology

¹⁵McCormick, *Rutgers: A Bicentennial History*, 92.

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professors from the east and west wings of Old Queen's in 1866 made that space available, and classrooms and laboratories were installed there, adding to the space already available in Van Nest Hall. However, as time went on, it was recognized that there was not adequate space in Van Nest Hall to accommodate chemistry, geology and natural science. In order to provide the needed additional space, Geology Hall was built in 1872 at a cost of \$63,000. It was situated on the Queen's Campus between Old Queen's and Van Nest Hall. It provided a lecture room and laboratories for the sciences. There was space in the basement for an armory for the military department, and the top floor was used for a natural science museum.¹⁶

Mathematics, Natural Philosophy, and Astronomy

When the Trustees decided to replace Theodore Strong in 1859, they first approached Elias Loomis, noted astronomer and textbook writer in the field of mathematics, and Professor of Mathematics and Natural Philosophy at the City University of New York. Loomis declined the offer and the following year succeeded Denison Olmsted at Yale. The effort to hire Loomis, demonstrates that The Trustees were trying to hire a faculty member of high academic stature.¹⁷

The Trustees then turned to Marshall Henshaw, who came to Rutgers as Professor of Mathematics, Natural Philosophy and Astronomy. Henshaw graduated from Amherst College in the class of 1845. After graduation he taught at Williston Seminary for a year, studied at Union Theological Seminary for a year, was Tutor at Amherst College for two years, and was ordained to the ministry in 1849, although he never became pastor of a church. For the next ten years he was Principal of Hopkins Academy at Hadley, Mass., Pinkerton Academy at Derry, N.H., and Dummer Academy at Byfield, Mass. He was a distinguished mathematician and a highly respected educator, although not in the class of Loomis. After four years of service at Rutgers, Henshaw resigned in 1863

¹⁶Demarest, *A History of Rutgers College*, 403-435.

¹⁷Vittum, *The Development of the Curriculum of Rutgers College of Rutgers*, 73.

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to become Principal of Williston Seminary. Subsequently, he became Lecturer of Natural Philosophy at Amherst College. He died in 1900.¹⁸



Figure 11 Marshall Henshaw

Henshaw's appointment was part of the Trustees' plan to strengthen the instruction in mathematics, physics and astronomy, and was concurrent with their request to Theodore Strong to withdraw from his teaching assignments of many years. The plan provided for a senior professor of mathematics, a professor of mathematics, natural philosophy, and astronomy, and a professor of chemistry and natural history. Under this plan, the Senior Professor of Mathematics would teach only members of the senior class in differential and integral calculus and in analytical geometry. Astronomy was to be taught in the junior year by the Professor of Mathematics, Natural Philosophy, and Astronomy. The instruction in natural philosophy included mechanics, electricity and magnetism, sound and light. The Professor of Chemistry and Natural History was to teach chemistry, including chemical philosophy (heat and light), galvanism, electromagnetism, natural history, including geology, botany, zoology, mineralogy, physiology, physical geography, and meteorology. This array

¹⁸Demarest, *A History of Rutgers College*, 385, 395; Raven, *Catalogue of the Officers and Alumni of Rutgers College*, 40.

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of courses was initially the teaching responsibility of Strong, Henshaw, and Cook. This curriculum stayed in effect for many years.¹⁹

The *Rutgers College Catalog* for 1860-61 indicated that there had been substantial additions to the philosophical apparatus during the previous year, “including some of the more costly and delicate instruments for demonstrations in each department of physics.” In 1863 there was a change in the curriculum. Mechanics, statics, dynamics, hydrostatics, hydrodynamics, acoustics and optics were taught in the junior year. Silliman's textbook was used for heat, electricity and magnetism in the senior year. Astronomy was taught from Loomis' *Practical Astronomy*, and included theoretical and practical aspects of the subject, including time, latitude and longitude.²⁰

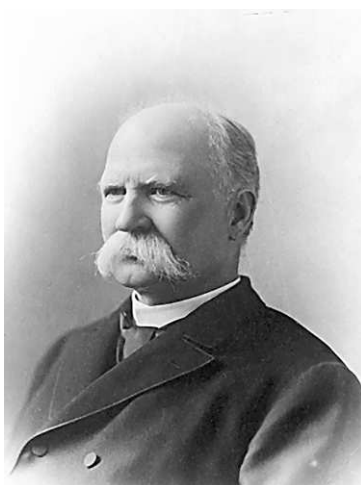


Figure 12 David Murray

When Marshall Henshaw left the College in 1863, the Trustees appointed David Murray as Professor of Mathematics, Natural Philosophy and Astronomy. He was a graduate of Union College in 1852, and he received the Ph.D. degree from the Regents of the State of New York in 1863, the year he came to Rutgers. He came to Rutgers from the Albany Academy where he was Principal. He distinguished himself as an unusual

¹⁹Vittum, *The Development of the Curriculum of Rutgers College of Rutgers*, 73.

²⁰*Rutgers College Catalogues*, 1860-63.

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teacher of mathematics, and he was a student of the history and methods of education.²¹

While Murray was at Rutgers, Japan was reaching out to the west for advice on building its educational programs. The United States Government assisted in this effort, by inviting American educators to submit papers on issues relating to Japanese education. Murray submitted a paper that was highly valued, and the Japanese government invited him to become its educational adviser. Murray accepted the offer in 1873 and went to Japan. He received a leave of absence from Rutgers, but resigned his position at the College in 1876. He held the position in Japan until 1879. Upon leaving Japan in 1879, Murray had an audience with the Mikado, where he received the honor of decoration with the Order of the Rising Sun. From 1879 to 1889, Murray was the Secretary of the Board of Regents of the State of New York. He became a Trustee of Rutgers College in 1892, and was Secretary of the Board from 1898 until 1904. After his death in 1905, a dinner was held in his honor, and Baron Makino, the Minister of Education for Japan, said that Dr. Murray's contributions to the development of education in Japan were such that his name would be remembered in Japan along with the names of Commodore Perry and Townsend Harris.²²

When David Murray left Rutgers College for Japan in 1873, the Trustees appointed Charles Rockwood as Professor of Mathematics, Natural Philosophy and Astronomy. In two years his title was changed to Professor of Mathematics and Astronomy, and Instructor in Natural Philosophy, perhaps in anticipation of the first Professor of Physics who was appointed in 1880. A graduate of Yale in 1864, Rockwood received his Ph.D. there in 1866. Rockwood had been Professor of Mathematics and Natural Philosophy at Bowdoin (1868-73) before coming to Rutgers. Rockwood left Rutgers in 1877 to become Professor of Mathematics at Princeton, a position he held until his retirement in 1905. In 1878 he was a member of the Princeton Eclipse Expedition to Colorado. He died in 1913.²³

²¹Demarest, *A History of Rutgers College*, 394-396.

²²Ibid., 394-396, 444, 445.

²³Raven, *Catalogue of the Officers and Alumni of Rutgers College*, 43.

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Figure 13 Charles Rockwood

Rockwood was succeeded by George Merriman, who graduated from Ohio Wesleyan in 1863, and taught mathematics at the University of Michigan and Albion College before coming to Rutgers in 1877 as Professor of Mathematics and Astronomy and Instructor in Natural Philosophy. In 1880 Merriman became Professor of Mathematics, Astronomy, and Experimental Mechanics, and in 1882 Professor of Mathematics and Astronomy. In 1891 Merriman went to Middlebury College as Professor of Mathematics and Astronomy, and in 1894 he moved to the U.S. Naval Observatory in Washington, D.C. He died in 1918.²⁴

Until the introduction of the system of electives in 1868, students in the Classical School took a term of mechanics in the junior year, which included statics, dynamics, hydrostatics, hydrodynamics, acoustics, and optics, and a term of physics in the senior year, which included heat, electricity, and magnetism. In 1868-69, after the introduction of the elective system, the classical students were required to take, in the junior year, two terms of natural philosophy, using Silliman's *Physics and Lectures*, and one term of astronomy, using Loomis's *Treatise on Astronomy*. The students could elect one subject each term in the junior year, Bartlett's *Analytical Mechanics* being one of the choices in the third term. In the senior year, the students could elect one subject each term,

²⁴Raven, *Catalogue of the Officers and Alumni of Rutgers College*, 44.

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practical astronomy with the use of instruments being one of the choices in the first term.²⁵



Figure 14 George Merriman

Beginning in 1871 Snell's *Olmsted's Natural Philosophy* was used in the natural philosophy course. Denison Olmsted, Professor of Natural Philosophy at Yale, first wrote his textbook on natural philosophy for colleges in 1831. It went through a number of revisions. It included the usual array of topics, including Newton's laws, hydrostatics, electricity, magnetism, and optics.²⁶ Beginning in 1877 Deschanel's *Elementary Treatise on Natural Philosophy* was used in the natural philosophy course. It was a more advanced textbook in four volumes, originally in French. It made more extensive use of algebraic equations in presenting the physics, and included such topics as electric potential and lines of electric force. In the section on thermodynamics, there is a description of the end of the caloric theory of heat around 1840, following the experiments of Joule. There is also a discussion of the mathematical work of Thomson, Rankine, and Clausius, which established the mechanical theory of heat, and built up the science of thermodynamics.²⁷ Beginning in 1870, Lockyer's *Treatise on Astronomy* was used in the astronomy course. In succeeding

²⁵*Rutgers College Catalogues*, 1867-90.

²⁶Olmsted, *A Compendium of Natural Philosophy*.

²⁷Privat-Deschnel, *Elementary Treatise on Natural Philosophy*.

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years the astronomy course used books by Ray in 1876, and by Brinkley in 1877.²⁸

The fourth College building to be erected on the Queen's Campus was the Daniel S. Schanck Observatory, built in 1865 at the east end of the campus, just east of the President's House. Daniel S. Schanck was probably born in New Jersey, and went into business in New York City at an early age. In 1865, in response to an appeal from friends of Rutgers College, he contributed more than \$2,400 for the construction of the observatory. According to Demarest, the cost of the Observatory and scientific equipment was more than \$6,000. The Observatory is quite interesting and is still standing. It is a small octagonal building, with an even smaller rear annex, overlooking George Street. It appears to be fashioned after the Tower of the Winds in Athens, and is considered a remarkable example of Romantic Classicism in America. The original Tower of the Winds housed a giant water clock and contained an accurate Sundial. This Greek building, dating from the first century B.C., is still standing in Athens. In 1966 Walter M. Widrig, Rutgers Art Curator, wrote: "Strangely, the Schanck Observatory today assumes the proportion of a garden pavilion on the Rutgers scene. One might even say its venerable age and quaintness have invested it with the nostalgic spirit of the old Rutgers, really a special kind of Romanticism pertinent to Rutgers alone. Hopefully Rutgers will keep for centuries to come this Romantic reminder of its past strivings for knowledge and this link with its classical heritage."²⁹

The Observatory was equipped with a six and one-half inch equatorial refracting telescope, a meridian circle with four-inch object glass for transit observations, a sidereal clock and a mean solar clock. There was a chronograph, repeating circle, and other instruments, and the Observatory was in telegraphic connection with other observatories. The longitude of the observatory is 0° 10' 29" east of the New Naval Observatory at Washington, D.C., and the latitude is 40° 30' N. In the later 1920's John Wyckoff Mettler, class of 1899, purchased a replacement telescope while on a trip to Europe. For many years the Professor of Mathematics and Astronomy was appointed as Director of the Schanck

²⁸*Rutgers College Catalogues*, 1867-90.

²⁹Lukac, *Aloud to Alma Mater*, 62-64; Demarest, *A History of Rutgers College*, 414.

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Observatory. The telescope was rebuilt after 1950, and some new equipment was added to the observatory at that time. Over an extended period of time courses in astronomy made use of the facilities of the Observatory, but the Observatory has not been used in recent years. It is hoped that in the future a fitting use may be found for this wonderful piece of Rutgers scientific history.³⁰

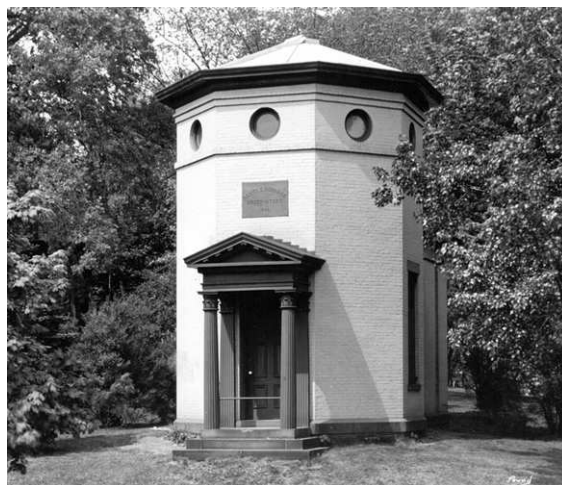


Figure 15 Schanck Observatory

³⁰Lukac, *Aloud to Alma Mater*, 62-64; *Rutgers College Catalogues*, 1883-1910.