

## Chapter Ten

### Move to Busch Campus Henry Torrey (1959-1964)

#### Rutgers University

During the 1960's Rutgers experienced unprecedented growth and development. Shortly after Mason Gross became President in 1959, the first of three bond issues was approved by the citizens of New Jersey, making it possible for Rutgers to proceed with a \$75 million building program. Erected on the main campus of the men's colleges were a general classroom building (Scott Hall), a building for the Graduate School of Education, a new dormitory complex for 1,000 students, a very large new dining hall (Commons), a graduate dormitory, and a substantial addition to the gymnasium. At the Busch Campus, a science center was built, with the erection of the Nelson Biology Building, the Physics Buildings, and an extensive engineering complex. At Douglass, Newark, and Camden there were additional construction projects. By 1964 most of the new buildings at the University were in use. Full-time undergraduate enrollments were at the level of 11,756 and graduate student enrollments were 5,586. Support for sponsored research was approximately \$12,000,000.<sup>1</sup>

#### Physics and Astronomy

In 1959 Henry Torrey took over as Chairman of the Physics Department. He served as Chairman until 1964. During his five years as Chairman, there were a number of important events in the development of the Physics Department. Low-energy nuclear physics and high-energy physics became major components of the research program, enhancing the significant solid-state physics program, already well developed. The nuclear physics program had begun earlier when Allen Robbins came to Rutgers in 1956 and the high-energy physics program had begun when Elihu Boldt joined the faculty in 1958. But it was the building of the

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<sup>1</sup>McCormick, *Rutgers: A Bicentennial History*, 316, 317.

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tandem Van de Graaff accelerator laboratory during the era of Henry Torrey that put the nuclear physics program on a solid footing as a major component of the Department's research program. Likewise, it was the hiring of Richard Plano in 1960 and the NSF supported computer and bubble chamber scanning facilities at Rutgers that established the high-energy physics program at Rutgers.



**Figure 32 Henry Torrey**

During Torrey's Chairmanship, there was an amalgamation of the Physics Departments at the College of Arts and Sciences (men's college) and Douglass College (women's college). This pioneering move was to have a significant impact on the undergraduate physics program for years to come, and was later to serve as a model for the unification of the other departments in the College in a later restructuring of undergraduate education in New Brunswick. Also, during Torrey's tenure as Chairman, major new physics buildings were completed on the Busch Campus. These included a new research laboratory, a lecture hall, and the nuclear physics laboratory. The Department had simply outgrown the space in Van Dyck Hall and badly needed the new space.

In 1959 Lloyd Greenlees retired after 35 years of service in the Department. Gerald Rothberg and Leo Sartori joined the Department. Rothberg received his Ph.D. degree from Columbia in experimental solid-state physics in 1959 and spent 1958-59 at the University of Leiden as an

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Adams Research Fellow. Sartori received his Ph.D. degree from MIT in theoretical physics in 1956. He was at Brookhaven National Laboratory in 1955-56 and Princeton from 1956-59. Also joining the Department in 1959 as a lecturer was Dr. Robert Webber.

There was a great deal of activity in the Department in 1959. Planning for the new physics building was well under way, with completion expected by the summer of 1962. Bernard Serin was Chairman of the new building committee. At that time it was expected that Van Dyck Hall would be used entirely for instruction in undergraduate laboratories and classrooms. The senior class of physics majors in 1959-60 was seen as one of the finest groups ever, with one member of the class receiving a Woodrow Wilson Fellowship and 3 others receiving National Science Foundation fellowships. In that year only 5 institutions in the United States received more than 3 NSF fellowships in physics for their seniors. There were 44 graduate students, with a shift in balance towards residence students (36). The research equipment was augmented by a new precision electromagnet and power supply, funded by an NSF grant. Grant support for research was at the level of \$129,000. Plans for the nuclear physics accelerator were well under way.

In 1960 the Department hired three faculty members who contributed greatly to the Department over a long period of time, Noémie Koller, Richard Plano, and George Horton. Also joining the Department was Anthony Hartland, a lecturer, who stayed for three years working in magnetic resonance, and three temporary faculty members on one-year appointments. Noémie Koller joined the Department as Assistant Professor, one of the first women to be appointed to the faculty in the College of Arts and Sciences. At that time it was somewhat unusual for a woman to be appointed to a faculty position in a men's college.

At N.J.C. women were appointed to the faculty from the time the College opened in 1918. Women joined the Physics Department at N.J.C., first as Assistant (Dorothy Dodd and Gladis Francis, 1928), then as Instructor (Dorothy Dodd, 1930), Assistant Professor (Katherine Van Horn, 1943), Lecturer (Emma Townsend, 1949), and Associate Professor (Emma Townsend, 1953). The only women with Ph.D.s to be appointed to the Physics Department at N.J.C./Douglass were Ellen Stewart (Assistant Professor, 1946), Emma Townsend (Lecturer, 1949), and Sophie Bargman and Mary Wheeler (Lecturers, 1959). Mary Wheeler had

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received her Ph.D. at Yale in 1932 for research with Louis McKeehan. She then went to Vassar College where she was Instructor and Assistant Professor, until she moved to Chicago in 1942 with her husband, Eugene Wigner. No woman ever became Professor of Physics at N.J.C. or Douglass College.

Before 1935 there were no women with faculty appointments outside of the New Jersey College for Women. In 1935 Anna Spiesman Starr became Director of the Psychological Clinic and Associate Professor of Social Psychology, following the death of her husband, Henry Starr, who had been Director of the Clinic. In 1944 Anna Starr was promoted to Professor of Psychology and Director of the Psychological Clinic.<sup>2</sup>

Beginning in 1946 a few women were appointed to positions of Research Associate or Research Specialist in the Bureau of Biological Research and the Bureau of Economic Research. In 1951 Rosalie Green was appointed Lecturer in Art in the College of Arts and Sciences. She remained on the faculty for a few years, but did not receive tenure.

Following Green's appointment, Noémie Koller and two other women joined the teaching faculty in 1960. Joanna Ratych was appointed Instructor in German, and Fredi Jakob was appointed Instructor in Chemistry. Koller was promoted to Associate Professor in 1965, the year that Joanne Elliott was appointed Professor of Mathematics. Koller and Elliot were the first women to receive tenure in the teaching faculty of the College of Arts and Sciences. Ratych also received tenure in 1970, while Jakob left the College after two years. Female students were not enrolled in the College of Arts and Sciences until 1972.

Koller was born in Vienna, Austria, received her Ph.D. degree from Columbia University in 1958, and was a research assistant at Columbia for two years (1958-60). At Rutgers, she was a member of the nuclear physics group working with the tandem Van de Graaff accelerator, and she did solid-state physics research using Mössbauer techniques.. In the final years of the accelerator, she was Director of the Nuclear Physics Laboratory. She served for a time as Associate Dean for Sciences at Rutgers College, where she was highly respected for her general insight and sound judgment. She was active on several committees for the

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<sup>2</sup> *Rutgers Magazine*, Fall 2000, p. 26; *Rutgers College Catalogues*.

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American Physical Society, and was Chair of the APS Nuclear Physics Division.

Richard Plano also joined the Physics Department in 1960, as Associate Professor. At the age of twenty, Plano had received his A.B. degree from the University of Chicago under Robert Maynard Hutchins Great Books Plan. He received the Ph.D. degree from Chicago in 1956, and was Instructor and Assistant Professor at Columbia (1956-60). He built a strong research program in experimental high-energy physics, which brought great credit to the Department. He started the use of computers in the Department and made them available to the Department members.

In his first year at Rutgers, Plano received an NSF grant of \$77,000 to support his high-energy physics research program. He set up an apparatus for scanning and measuring pictures from bubble-chamber experiments. When Plano arrived at Rutgers, the University computer was the IBM 650, installed in the basement of one of the Rutgers dormitories. It was a large vacuum-tube machine, with a memory that was a cylinder of magnetic material spinning at high speeds. The data were entered into the computer from punched IBM cards. Plano and others in the Department made use of this computer for their research.

Plano's research was advanced when the Digital Equipment Corporation (DEC) lent Plano a PDP 1 computer about the time the Department moved to the new Physics Building in 1963. Plano used the PDP-1 for the first on-line checking of data from bubble-chamber scanning machines. In 1963 the IBM 1620 replaced the University's IBM 650 computer. The new computer had individual transistors, and memory consisted of a matrix of magnetic cores. It provided for programming with FORTRAN. The 1620 computer was replaced by the IBM 7040, which allowed for batch processing for multiple users. The IBM 360-67 which allowed time-sharing use, in turn, replaced it. Plano was instrumental in the choice of these computers, and with his group of seven graduate students, contributed to their installation and development.

Plano's PDP-1 computer was replaced by a PDP-6 computer in 1965, giving the Physics Department an advanced time-sharing machine with more power than the University's computing center. This was used for online checking and analyzing of the bubble-chamber experiments, and provided computing for the rest of the Department. It was soon replaced

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by a PDP-10, a similar but more powerful computer system. The PDP-10 served the high-energy physics group, the Department, and some of the rest of the University, for nearly 20 years, when it was replaced by the VAX computers. Plano received substantial support from the NSF for the development of these computers, as well as from the University. In parallel, the Nuclear Physics group developed a computer capability around an SDS Sigma 7 computer. Later still, the Sun computers, with their UNIX operating systems came to provide the major computing support for the Department.

George Horton joined the Physics Department at Douglass College as Professor and Chairman in 1960. He joined the Arts and Sciences Physics Department the following year, when the Douglass College Physics Department was combined with the Arts and Sciences Physics Department. Horton was born in Braunsweig, Germany. He received his Ph.D. degree in mathematical physics from the University of Birmingham, England, in 1949, a student of Rudolf Peierls. He then was a postdoctoral fellow with Wolfgang Pauli and Walter Heitler at Zurich (1949-51), Assistant and Associate Professor at the University of Edmonton, Canada (1951-59), and Scientific Officer at the National Research Council, Ottawa (1959-60). Although his early work was in nuclear physics, at Rutgers he became a member of the condensed matter theory group.

In July 1961, the Physics Departments of the College of Arts and Sciences and Douglass College joined together to become a single department under the Dean of the College of Arts and Sciences. The Chairman of the Physics Department at Douglass, Wilfred Jackson, died in March 1959. He had been on the Physics Faculty since 1928, and Chairman of the Department since 1946. Frank McGar, who came to the Douglass College Physics Department in 1957, served as Acting Chairman there for 1959-60, assisted by Mary Wigner, and a number of temporary appointments.

Following the death of Wilfred Jackson in 1959, a Committee was set up to study the relationship between the Physics Departments at Douglass College and the College of Arts and Sciences. Richard Weidner and Herman Carr were the representatives from the College of Arts and Sciences. They submitted a report in 1959 recommending a combined undergraduate program in physics for the students at Douglass College and the Men's Colleges in New Brunswick. They pointed out that there had

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been 66 men graduated as physics majors in the previous ten years, while there were a total of only fourteen women graduated as physics majors in the same ten-year period. With only one or two physics majors graduating from Douglass College each year, the majority of the students enrolled in the junior-senior physics courses at Douglass College were majors in mathematics and chemistry. Therefore the advanced courses in physics at Douglass College were directed primarily to the needs of non-physics majors. It was argued that the combined program in physics would provide a better education in physics for Douglass College physics majors.<sup>3</sup>

Mary Bunting, Dean of Douglass College, rejected this proposal for a combined program in physics. Henry Torrey reported that Dean Bunting had expressed the view that there was a difference between men and women, especially with regard to prior training and background, which made it difficult for women to keep up with men in physics courses designed for the latter. She believed that women needed their own courses. She also believed that the physics staff should have their research at Douglass so that Douglass undergraduates would be able to get the flavor of real physics. These views still persist to a degree.

In February 1960, Dean Bunting was elected President of Radcliffe College, although she retained certain responsibilities at Douglass College until April 30, 1960. She sought the help of Henry Torrey in hiring a replacement for Wilfred Jackson, as Chairman of the Physics Department at Douglass. Since Dean Bunting was not on campus very much during this period, the job of recruiting the new Physics Department Chairman at Douglass fell mostly to Torrey. He succeeded in recruiting George Horton, who was at the University of Alberta. Torrey reported that he had recruited a real scholar with a good publication record for the Douglass College Physics Department. Torrey reported that, at the time he was recruiting Horton, he did not have in mind combining of the two departments.

Before his arrival in the fall of 1960, Horton pressed for staff and resources for the Physics Department at Douglass College that would be comparable to those for the Physics Department Rutgers College. He argued that a minimum of five full-time faculty members were required for

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<sup>3</sup>Interviews with Henry Torrey and Herman Carr; Department Archives.

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the Douglass Physics Department, with lecture loads of 2 courses, and with adequate research facilities. The teaching loads at Douglass had been more like 15 hours a week. He further argued that it would be more efficient and cost effective to provide the research facilities in the new physics building at the Busch Campus, necessitating an enlargement of that building by 20%.<sup>4</sup>

Ruth Marie Adams, Professor of English at the University of Rochester, became Dean of Douglass College on July 1, 1960. In the fall of 1960, Henry Torrey and George Horton, with the unanimous support of the Physics Section, proposed that the Physics Departments at the College of Arts and Science and at Douglass College be merged into a single department under the Dean of the College of Arts and Sciences. At that time the physics faculty at Douglass College consisted of George Horton, Frank McGar, who was scheduled to be on leave in 1961-62, Mary Wigner, and two empty faculty lines.

It was expected that George Horton would continue to be in charge of physics instruction at Douglass College, and that he would be the Executive Officer for the Physics Department for 1961-62. Dean Adams was sympathetic to the proposal to combine the two physics departments, and the proposal to combine the departments was accepted at Douglass and implemented on July 1, 1961. This combination of the two departments was a model for the later amalgamation of the other academic departments in New Brunswick in the academic reorganization that followed.

There were those at Douglass College who did not view the combining of the physics departments as a positive step. In his 1968 history of Douglass College, George Schmidt chronicled that physics had been “lost” to Douglass College. While acknowledging that the Physics Department at Douglass could not support the cost of the new electronic equipment for a handful of majors, Schmidt commended the previous Chairman, Wilfred Jackson, for teaching physics not only for specialists, but also for those who wanted physics as a part of their liberal education.<sup>5</sup>

In 1961 Theodore Kruse and William McLean joined the faculty as assistant professors. Kruse received his Ph.D. from Columbia University

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<sup>4</sup>Interviews with Henry Torrey and George Horton; Department Archives.

<sup>5</sup>Schmidt, *Douglass College: A History*, 230.



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in 1959, working on the Van de Graaff accelerator there. He stayed at Columbia for two years as a research associate before coming to Rutgers in 1961. He became an important member of the nuclear physics group at the tandem Van De Graaff accelerator. McLean, a native of New Zealand, received his Ph.D. from Cambridge University, England, in 1960, and was Instructor at the University of British Columbia for a year, before coming to Rutgers in 1961. His area of research was experimental low-temperature physics.



**Figure 33 Peter Lindenfeld Lecturing to High School Teachers in Van Dyck Lecture Hall about 1962**

The College Bond Issue of 1959 provided funds for the construction of a new physics laboratory and lecture hall on the University Heights (Busch) Campus. These funds were supplemented in the fall of 1960 by a grant from the NSF. Detailed planning for the building was done in the period of April 1960 to July 1961. Bernard Serin was Chairman of the Building Committee during this planning period. Construction began in August 1961, and was completed in June 1963.

When the Department moved out of Van Dyck Hall in June 1963, it contained: research rooms, machine shop and student shop in the basement; physics library, departmental and other offices, classrooms, and research laboratories on the first floor; physics lecture hall, offices, instructional laboratories and classrooms on the second floor; more offices, classrooms, and instructional laboratories on the third floor; and a wonderful attic with large amounts of war surplus material and equipment. Hanging above the door to the library in Van Dyck Hall was an oil portrait

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of Francis Cuyler Van Dyck, Chairman of the Physics Department from 1880 to 1917.<sup>6</sup>

The Physics Building that was constructed in 1963 had a gross area of 43,000 sq. ft. It had shops and large research rooms on the first floor, and then two floors of offices, research laboratories, and the physics library. All together there were 45 offices, 44 laboratories, administrative and secretarial offices, seminar rooms, library, shops and stockrooms. The outside skin of the building was made of precast concrete panels bolted in place, and had a dramatic appearance, quite different from the red brick of the earlier buildings.



**Figure 34 New Physics Building on Busch Campus**

In November 1964 there was a dedication ceremony for the new Physics Research Laboratory, Physics Lecture Hall, and Nuclear Physics Laboratory. Dr. Frederick Seitz, President of the National Academy of Sciences, visited the Department and spoke at the ceremony. Adjacent to the new Physics Building was a Lecture Hall with an interesting pie-shaped configuration. It had a gross area of 9,000 sq. ft., and contained a 330-seat lecture hall, together with a preparation room, lobby, and exhibit room.

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<sup>6</sup>Physics Department Archives.

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Leaving the faculty in 1963 were Anthony Hartland after three years, Leo Sartori, after four years, and Robert Sells, after ten years. Sartori went on to M.I.T., as a member of the Science Teaching Center, and then later to the University of Nebraska-Lincoln. Sells went to SUNY Geneseo, as Professor, and later as Chairman of the Department. Joining the Rutgers Physics Department in 1963, were Stuart Meyer as Assistant Professor, Saul Barshay and Ronald Rockmore as Associate Professors, and Georges Temmer as Professor and Director of the Nuclear Physics Laboratory. Meyer worked with the high-energy experimental physics group, and Barshay and Rockmore strengthened the high-energy theoretical physics group. Temmer came to Rutgers from Florida State University, bringing with him a distinguished career in experimental nuclear physics. He took on the responsibility for the new tandem Van de Graaff accelerator and the nuclear physics research program associated with it.



**Figure 35 Farewell Party for Robert Sells in 1963**

Bottom Row (seated): Unknown, Helen Torrey, Henry Torrey, Pat Sells, Robert Sells, Jeanette Whitmer, Charles Whitmer, Louise Plano, Jean Weidner.

Top Row (standing): Herman Carr, Hilda Carr, Ernest Lynton, Carla Lynton, Elihu Boldt, Shirley Robbins, Elizabeth Weiss, Peter Weiss, Lloyd Greenlees, Bernard Serin, Bernice Serin, Peter Lindenfeld, Richard Weidner, Lore Lindenfeld, Theodore Kruse, Allen Robbins, Margaret Kruse, Richard Plano.

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For some time the Department had sought to broaden its research program to include nuclear physics. In the spring of 1959, a committee consisting of Professors Weiss, Dunnington, and Robbins developed a proposal for a tandem Van de Graaff accelerator. The Department unanimously endorsed this proposal and it was forwarded to President Gross. The president was sympathetic to the idea, and letters of support were obtained from various distinguished physicists in the area, endorsing this proposal. Two years later, in April 1961, President Gross decided to apply the funds from a bequest of approximately \$1,000,000 towards the development of a nuclear physics program at Rutgers. This represented a fulfillment of a pledge to develop atomic energy at Rutgers, which the president had made at his inauguration in 1959. In applying the funds from the bequest to a nuclear physics accelerator, President Gross bypassed other needed projects at the University, such as the building of a concert hall.

After the President committed the University to the accelerator project, Bell Telephone Laboratories came forward with an offer to join the project. BTL had been considering the acquisition of a tandem accelerator for themselves, and when they heard that Rutgers was considering the purchase of a tandem accelerator, they proposed a collaboration. Bell Laboratories proposed to provide the additional funds necessary to purchase a 15 MeV tandem accelerator instead of the 12 MeV tandem accelerator that had originally been planned. President Gross and the Board of Governors were enthusiastic about the proposal, and in July 1961, the Board of Governors approved the use of University funds for the purchase of a tandem Van de Graaff accelerator. In December 1961, Bell Telephone Laboratories and Rutgers signed an agreement for the joint use of the accelerator, and an order for a 15 MeV tandem Van de Graaff accelerator was placed with the High Voltage Engineering Corporation.

The cost of the accelerator was approximately \$1,200,000, the cost of auxiliary equipment was about \$400,000, and the cost of the accelerator building was about \$1,100,000. These funds were provided from the William P. Allen bequest, approximately \$850,000, University resources, a State of New Jersey appropriation, and \$500,000 from BTL. The National Science Foundation provided grants of \$272,000 and \$446,300 on December 1, 1962, and January 15, 1964, for auxiliary equipment for

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the accelerator. Eventually, the NSF provided operating support for the program, with additional funds coming from the University and BTL. The relationship with BTL turned out to be a particularly successful industry-university collaboration.

Planning for the Nuclear Physics Laboratory was begun in June 1961, with Theodore Kruse as Chairman of the Building Committee. Construction began in January 1963, and was substantially completed by November 1964. The building had a gross area of 25,400 sq. ft., and contained a control room, accelerator room, target rooms, laboratories, preparation rooms, conference room, and office for the Director of the facility. Georges Temmer joined the Department in July 1963, and became Director of the Nuclear Physics Laboratory. Installation of the accelerator began July 1, 1964, and the first beam was obtained October 1, 1964. There were difficulties in getting the accelerator going, but experimental use of the machine began in May 1965. In the succeeding years the research from the Nuclear Physics Laboratory enhanced the already significant reputation of the Physics Department.

The Department's research continued in the areas of the properties of matter in bulk (low-temperature physics, physics of the solid state, and magnetic resonance), high-energy physics, and nuclear structure physics. A few examples follow.

Lynton and Lindenfeld continued their measurements of the thermal conductivity of superconductors, and Koller worked on the Mössbauer effect in superconductors. Weiss studied the effects of paramagnetic impurities in superconductors, and Horton worked on the statistical mechanics of ideal gas solids. Kruse and Robbins began proton scattering experiments on the tandem accelerator. Boldt examined the decay spectrum for stopped cosmic ray particles at sea level, and Plano measured the lifetime of the  $\omega$  meson, and examined the  $\beta$  decay of  $\Sigma^+$  and  $\Sigma^-$  hyperons. Nishimura studied the effects of K-meson interactions on the nucleon anomalous magnetic moment.

Henry Torrey's service as Chairman of the Physics Department came to an end in 1964. He went on leave for a year and returned as Dean of the Graduate School. He had found the burdens of the office of Department Chairman to be substantial, demanding a major portion of his time. Peter Weiss agreed to replace Torrey as Chairman. Torrey believed that until someone acceptable to all, who desired to make a career of the

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job of Department Chairman, came along, the office should be rotated among the senior staff. Torrey received some relief from the administrative burdens in his last year with the appointment of a business manager for the Department of Physics and the Nuclear Physics Laboratory. This new appointment of a business manager would be of great importance for the department chairmen who succeeded Torrey.

As Torrey's term of office came to an end, the areas of departmental research were: a) properties of matter in bulk (low temperature physics, physics of the solid state, and magnetic resonance); b) high energy physics; and c) nuclear structure physics. When Henry Torrey came to Rutgers in 1946, there were 6 faculty members in the Physics Department at the College of Arts and Sciences and 3 faculty members in the Physics Department at the New Jersey College for Women. In 1964 Torrey ended his term as Chairman of a combined Physics Department of 23 faculty members. The development of the Physics Department under Henry Torrey was a part of the overall expansion of the University in a period when there was significant support from the State of New Jersey. In his final Department Report, Torrey argued very strongly that the Department should inaugurate a program in astronomy and astrophysics at the earliest opportunity. He asserted that the deficiency in this area at a large state university such as Rutgers was scandalous. A single course in astronomy was still being taught in the Mathematics Department at Douglass College. It would still be some years before the Physics Department was able to move ahead in this area.