A Brief History of the Department of Mathematics
by Professor T. J. Benac

Following the establishment of the Navy Department in 1794 the period leading to the founding of the Naval Academy is marked by reports expressing concern about officer preparation that usually indicated the need of mathematics. In 1802 the education of midshipmen was resolved by instructing them on board ships at sea with chaplains as schoolmaster. The need to provide instruction in mathematics and navigation led to the authorization in 1813 of civilian schoolmasters, and teachers of these technical areas were eventually appointed as professors of mathematics. In 1848 Congress approved an act by which professors of mathematics could be commissioned with rank in the navy.

By the early thirties temporary "cram" schools were operating at three navy-yards, and beginning in 1838 midshipmen approaching examinations for promotion were assigned to a naval school in Philadelphia for eight months of study, that included instructions in algebra, geometry and trigonometry. After serving at sea for one year, the young William Chauvenet was placed in charge of the school in 1842 and immediately took steps to improve its program. His proposal for expanding the school to two years provided George Bancroft, the Secretary of the Navy, with a workable plan for a permanent academy.

The Naval School at Annapolis was established in 1845 as a two-year academic program with a teaching staff of seven including Chauvenet as professor of mathematics and navigation plus three more teachers from the naval school in Philadelphia. The course of study in mathematics consisted of arithmetic, algebra and geometry for the junior class and algebra, geometry, plane and spherical trigonometry for the senior class. Mathematics classes met five days a week and all midshipmen were required to recite daily. After five years the school underwent a major reorganization that included changing its name to the United States Naval Academy and extending its academic program to four years. The new course of study was organized into six departments. One of these, the Department of Mathematics, was chaired by Professor Chauvenet, and its program consisted of arithmetic, algebra , geometry, trigonometry and descriptive geometry in the first two years, analytic geometry, calculus, astronomy, navigation and surveying in the last two years. In 1853 the courses in astronomy and navigation were assigned to the new Department of Astronomy and Navigation with Professor Chauvenet as

its head. At the same time, the mathematics program was reduced to five terms and John Coffin, a professor of mathematics in the navy since 1836, became head of department.

William Chauvenet, appointed professor of mathematics in 1841, was the most influential member of the faculty. He served on the Academic Board for fourteen years and was its president from 1847 to 1850. Also, he was the only professional educator on the seven-person board appointed by the Secretary of the Navy in 1849 to study the new Naval School and submit recommendations. His "Treatise on Plane and Spherical Trigonometry," written and published while he was in Annapolis, became a widely used college textbook. After his resignation in 1859, he had a distinguished career as the Chancellor of Washington University in St. Louis. His treatise "A Manual of Spherical Practical Astronomy," that evolved from teaching astronomy and navigation, was translated in several languages. The president of Johns Hopkins University, in his graduation address to the Class of 1876, referred to Chauvenet as the individual "who shaped [the Academy's] scientific courses." In 1925 the Mathematical Association of America recognized his expository skills when it established the "Chauvenet Prize." A new addition to the Academy's physical plant, Chauvenet Hall, was dedicated in 1969 with five Chauvenet Prize winners presenting papers.

The temporary location of the Naval Academy in Newport, Rhode Island during the Civil War seriously disrupted its program. With its return to Annapolis the mathematics program reverted to its prewar status, except that lower ranking students were usually not required to take descriptive geometry and calculus. Meanwhile, the postwar period witnessed a gradual decrease in the influence of professors and a vigorous revival of the trend toward professional education, which had emerged before the war. The mathematics department was profoundly affected by the Academy's new orientation, for by 1870 it was operating with an all-officer faculty and ten years later its teaching staff consisted of six junior officers. Furthermore, in 1871 its program was reduced to four terms, because the improved preparation of entering students justified dropping arithmetic and the increasing emphasis on professional development led to the transfer of calculus to the department teaching mechanics. These changes in staff and program remained in effect until the end of the century. Together with the fact that for the twenty-seven years extending from 1873 to 1890 and from 1897 to 1907 the department was chaired by the same officer, it was inevitable that traditional practices would be maintained and that the department would lose its former mainstream

position. Even innovative changes in the Academy's curriculum hardly affected its program. For example, when an elective program was approved by the Academy, the department's response was to allow Fourth Classmen to enroll in descriptive geometry or theory of equations and Third Classmen to take a course in calculus.

The return of calculus in 1899 started a new era in the department's development. An immediate effect was the extension of its program to five terms. Though this was reduced to four within two years, the impact on the program was minimal, because starting in 1903 mathematics classes throughout the Fourth Class year met six times a week instead of five, a change maintained until World War II. Events, crucial to upgrading the department, occurred in 1907. This was the year in which its name was changed to the Department of Mathematics and Mechanics. As a result, the entire Second Class year was dedicated to the study of mechanics, though after four years the program was consolidated to five terms. Also, in this year Stimson Brown, the Director of the Nautical Almanac before he joined the department in 1901, was appointed head of department. The new chairperson, a Professor of Mathematics, USN, was the author of several mathematics textbooks. Meanwhile, by 1907 its faculty had grown to two regular officers, six civilians and six Professors of Mathematics, USN. This fourteen-man staff, which remained essentially intact for five years, generated an environment that was definitely academically oriented. Obvious indications are the use of several staff-written texts and the enrichment of the mechanics course by the inclusion of applications from strength of materials and hydromechanics. The case of Professor W. Woolsey Johnson should be mentioned. Not only was he the author of widely used textbooks in calculus and mechanics, but Volume I of the Bulletin of the American Mathematical Society contains a paper that he presented at a meeting of the society.

In 1916 the department was renamed the Department of Mathematics. This year also marked the start of the impact of World War I on the faculty. The anticipated increase in the student body and military mobilization was resolved by appointing civilians. Thus, from 1916 to 1918 the number of civilians in the mathematics department increased from sixteen to twenty-eight, and the number of regular officers dropped from five to none. Included among the new instructors were several PhDs.

Although the wartime schedule had only a minor impact on the mathematics program, the department experienced a variety of changes during the period between the two world wars. Some examples are given. In 1919, the

same year that the Academy adopted the four-grade ranking system used in colleges, the department appointed eight new civilians and now included eight PhDs, an indication that the new policy placed the Academy in a more competitive position for attracting university graduates. The plebe year was extended by four weeks in 1925, with classes meeting five times a week before the start of the academic year. The material studied was mainly from solid geometry and stressed mensuration in three dimensions. This summer term was dropped just before World War II, after the replacement of solid geometry by trigonometry for one year. In 1929 the slide rule became a formal part of the mathematics program and served as the midshipmen's primary calculator until 1976. The thirties witnessed a new emphasis on humanities and, by spending less time on calculus, the mathematics program was reduced to four semesters from 1933 to 1939. One notes that with the retirement of Captain H.L. Rice, who joined the department in 1907, the academic year 1933-34 marked the last time that the department included a Professor of Mathematics, USN.

Furthermore, throughout this period the civilian staff experienced numerous changes, some of which were initiated by economic conditions. Thus, while the department had 38 civilians in 1921, the number dropped irregularly to 14 by 1933 and finally settled at 24 by 1935. Teaching methods were liberalized to the extent that reports of Board of Visitors in the thirties say that, during visits of mathematics classes, members had observed that time was provided, after assigned work was completed, for further discussion of material. Also, the department became an active supporter of the MD-DC-VA section of the Mathematical Association of America by hosting meetings of the section, and members of the civilian staff regularly attended meetings, served as officers of the section and presented papers at sectional meetings. A scholarly activity, widely pursued within the department, was writing textbooks. Some served as texts for department courses such as differential equations, mechanics, plane and spherical trigonometry. Professor Scarborough's treatise "Numerical Mathematical Analysis," is noteworthy. Published by the Johns Hopkins Press in 1930, it was widely used as a textbook and reference book after World War II and a sixth edition appeared in 1966.

In 1941 the anticipated mobilization for war led to the appointment of civilians and newly commissioned reserve officers. In mathematics, ten civilians were appointed including instructors Abbott, Benac and Betz, who celebrated in 1991 fifty continuous years of service. The department's teaching

staff during the World War II years remained at a level of twenty-five civilians and a few more reserve officers. Since most of the new individuals had PhDs and were recruited from colleges and universities, instruction in mathematics was in the hands of professional educators and rigid classroom procedures were largely abandoned. The wartime program in mathematics was a seven-trimester sequence that covered the prewar curriculum except that the topic of differential equations was incorporated in the calculus and solid geometry was dropped.

In the postwar period the department witnessed several non-curricular changes. With the departure of most reserve officers, more civilians were hired. By 1948 it was operating with three regular officers and sixty-one civilians, all above the rank of instructor. This distribution gradually changed and stabilized in 1956 to forty-eight civilians and sixteen officers. Meanwhile, in 1952 the department moved from Maury Hall to two converted "shop" buildings, a relocation that was supposed to be short-termed but lasted until 1968, when the department moved to Chauvenet Hall.

With the return of the Academy in 1946 to its prewar status, the mathematics program started with a review of algebra and plane trigonometry in the summer term followed by algebra, plane trigonometry, analytical geometry and calculus during the Fourth Class year. In the Third Class year calculus with differential equations, and mechanics were studied. The program in the first semester of the Second Class year included mechanics and spherical trigonometry. External pressures, initiated to a large extent by the Stearns-Eisenhower Committee, led to significant modifications in 1951. For example, the mechanics program in the Second Class year was replaced by a course in strength of materials and by omitting statics, mechanics was consolidated into a one semester course; also, after dropping the summer term the Fourth Class year started one week earlier. A final important change occurred in 1959 when, due to ongoing internal pressures, strength of materials was transferred to the engineering department and replaced by a course in differential equations.

Since the early days of the Academy the mission of the department had remained basically the same. In 1952 it was expressed as follows: "To teach mathematics not as a pure science but as a tool of the technical professions, and to teach only those branches of it which have direct naval applications." However, the mission in 1956 began with the statement, "The objective of this department is to teach mathematics as a basic science —-." This declaration in favor of studying mathematics for its own sake was both significant

and timely, for in 1957 the Academy included the Fourth and Third Class years of mathematics in the accelerated program and in 1959 approved an extension of the elective program allowing midshipmen to substitute electives for prescribed courses and to "overload with an elective." A course in matrix theory was the first overload offered in mathematics since the late 1880s. Meeting three times a week during the seventh period of the spring term, enough midshipmen voluntarily enrolled to warrant four sections. In 1960 the Academy approved the department's request to offer an academic major. Due to the amount of mathematics and mechanics in the prescribed curriculum, the major required only fifteen more semester-hours. The available elective offerings were Matrix Theory, Modern Algebra, Advanced Calculus I and II, Probability and Statistics, Numerical Analysis, Complex Variable Theory, and a Science Research Project.

During the sixties, internal and external pressures greatly influenced the Academy's program. Though the "core" curriculum in mathematics remained a five-semester sequence, individual courses underwent many changes. For example, in 1960 plane trigonometry was dropped and for midshipmen admitted without trigonometry ten hours of instruction were included in plebe summer. After 1960 algebra was no longer cited as a course of study, though certain topics were incorporated in other courses. For most of this period the third semester became a composite course consisting of calculus plus topics from probability or computer programming. With the adoption of the minor's program in 1964, all courses during the first four semesters met four times a week instead of five, calculus became the course of study for the plebe year, spherical trigonometry was dropped, and the courses in differential equations and mechanics were interchanged. However, the sharpest departure from the long-standing orientation of the department occurred in 1968 when mechanics, the course that had served as the capstone of the mathematics program since 1907, was dropped and replaced by a course in probability and statistics.

The start of a major-for-all program in 1969 was the inevitable culmination of innovations that had already produced a number of graduates with a major. The impact on the mathematics in the core curriculum was dramatic. Instead of the traditional sequence of five courses, it initially became two semesters of calculus plus a mathematics course dependent on the student's major. Then in 1976 all majors were required to take three semesters of calculus plus a course in differential equations. The last change took place in 1991 when the core's fourth course became dependent on choice of

major. Clearly, the calculus maintained a dominating position in the core. To make it more responsive to the majors and students, sequences of calculus courses were formed with enrollment decided by placement exams in the plebe summer and performance during the academic year. One of these sequences, started in 1969 and still operating, integrates the computer with the calculus. It involves teaching a programming language, as well as the traditional calculus topics, and requires students to develop their own computer programs instead of using currently available software.

A marked change in the organization of the department occurred in 1970. From 1923 to 1970 it was chaired by regular naval officers, usually as a three-year tour of duty. In 1942, to ensure continuity and academic expertise at the administrative level, the Academy created the rank of Senior Professor. Initially, the mathematics department had two Senior Professors. In 1951 this was reduced to one, and the department compensated by operating with Class Chairmen. This position was assigned to a civilian staff member who became responsible for hour-tests, exams, textbooks, syllabi, counseling, etc. for a specific Class as it progressed through the mathematics program. With the reorganization of the Academy in 1970 the position of Chairperson eliminated these administrative levels. To date, all chairpersons in mathematics have been civilians serving a six-year term.

Since the mid seventies women, both as officers and civilians, have been members of the mathematics faculty, which still consists of forty-eight civilians and sixteen officers. All civilians have PhDs and are engaged in scholarly activities, such as preparing materials that support classroom presentations, writing textbooks and papers for technical journals, providing professional services, working on projects sponsored by governmental agencies. Elective offerings in mathematics include a wide range of theoretical and applied courses. The mathematics major allows concentration in "pure" mathematics, operations analysis or scientific computing. For selected students an "honor" program is available and the opportunity to conduct independent research with a faculty advisor.

The present department is aggressively responsive to the diverse backgrounds of midshipmen and the new educational ideas sweeping the mathematical community. It strongly supports methods of instruction based on small classroom sections and encourages the use of modern technology. Without losing sight of the importance of factual knowledge and analytical skills, the department seeks to prepare graduates for a vital naval career by providing an educational experience that arouses intellectual curiosity and develops

critical thinking.