# History of the Department of Mathematics of The University of Kansas 1866-1970


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# Preface

Francis Huntington Snow, in 1866, was the first member of the faculty to teach mathematics in The University of Kansas. From this auspicious beginning, mathematics developed into one of the major departments in the University; its staff has contributed many of the most distinguished and best loved members of the faculty. It is thus altogether fitting that someone should write a history of the Department of Mathematics and its staff. Furthermore, almost no information about the Department is available at the present time. Although Sterling's *Quarter-Centennial History of The University of Kansas, 1866-1891*, Robert Taft's *Across the Years on Mount Oread* and *The Years on Mount Oread*, and Hyder's *Snow of Kansas* contain partial histories of the University, they yield almost no information about the Department of Mathematics or its mathematicians. Griffin's *The University of Kansas: A History*, published in 1974, is the University's official history; it contains more information about mathematics but not a complete history of the Department.

A number of years ago, when I was Chairman of the Department of Mathematics, I asked one of my predecessors to write a history of the Department, but he was unable to do so. In September 1970, in response to a request from the new Chairman, Professor Paul S. Mostert, I agreed to prepare an account of the Department. Not being a trained historian, however, I completely misjudged the assignment I had accepted. I thought at first that I would be able to write an adequate account of the Department's history in a few weeks' time, but I soon discovered that, for a number of reasons, the writing of a worthwhile history would be a major project. First, I did not know the history of either the Department or the University. Second, when I began in 1970, there was no complete history of the University (Griffin's history was not published until

1974), and I was forced to learn and write at least the outlines of the history of the University as a background against which to describe the history of the Department. Third, I decided to write--not a streamlined account of events--but rather a history that is also a record, a history that contains many original documents and reports, and much factual information about the University, the Department, the staff, the students, the courses, the degrees, the buildings, the libraries, and the forces and circumstances that controlled events. Fourth, and most important of all, I decided to try to write history rather than recount folklore and reminiscences. Although I have not had access to all of the original sources and to all of the University's archives, I believe that the account presented here is factually correct, documented history.

The first draft of this *History of the Department of Mathematics* was written between September 1970 and June 1972; it has been revised and reorganized in 1976. Most of the documents, reports, records, and long quotations have been placed in the Supplement at the end of the book. The notation [Sterling 1, p. 104] is a reference to page 104 of item 1 under Miles Wilson Sterling in the References and Notes section which follows the six chapters at the beginning of the book; [S, ch. 2, sec. 1] is a reference to section 1 of chapter 2 in the Supplement; and [S, Appendix VI] is a reference to Appendix VI in the Supplement.

The pioneers in the early years struggled against overwhelming obstacles and built a distinguished university. This *History of the Department of Mathematics of The University of Kansas* presents an account of their struggles and of their successes and failures, especially in the field of mathematics. I have written it as a tribute to the determination, the courage, the perseverence, and the memory of those who preceded us, and I hope that it will be also an inspiration and a challenge to those who follow.

It is a pleasure to record my appreciation and thanks for the assistance I have received in the preparation of this history. First of all, I would like to acknowledge my indebtedness to my wife, Cora Lee Beers Price, who not only endured the writing of it but who also read and criticized the manuscript. Next, I would like to thank those who have contributed material for this history. Wilimina Everett Pitcher (Mrs. Arthur Dunn Pitcher) wrote, at my request, the reminiscences of the University and of the Department during the period from 1903 to 1911 which appear in Appendix II. Both Mrs. Pitcher and her husband received degrees from The University of Kansas; he was a member of the Department's staff from 1906 to 1911 although on leave as a graduate student at the University of Chicago from 1908 to 1910. Caroline Newson Beshers (Mrs. Hugh N. Beshers) has contributed three letters (Appendix III) which add a great deal to our knowledge of her father and mother (Henry Byron Newson and Mary Frances Winston Newson--both mathematicians) and of the Newson family. Chancellor Emeritus Raymond Nichols has contributed his paper entitled "The Role of Ellis B. Stouffer in the Development of The University of Kansas" (Appendix VI), which he read at the E. B. Stouffer Conference in Mathematics on October 24, 1974, to this history of Dean Stouffer's department. Professor Florence Black wrote her reminiscences of her early life in "Life on the Cattle Range in the Early Days of Western Kansas, or Moses Moves to Kansas" (Appendix VII) for one of the Department's dinners, and she permitted me to include it in this history. I am indebted to Clifford S. Griffin, Professor of History and author of *The University of Kansas: A History* (the University's official history) for copies of important records, reports, and correspondence from the University's archives; most of these documents were either written by, or are related to, Professor Ephraim Miller. Next, for their assistance in locating the information and materials I needed, I thank the members of the staff of the Spencer Research Library, especially Mr. John M. Nugent and his assistants, Mr. Edward Kehde, Mrs. Carol A. Massieon, and Mrs. Sally Atkinson in Archives, and Mr. L. Frank Aydelotte and his assistants in Regional History. Mrs. Kate Torrey assisted in preparing the final manuscript, and Mrs. Veronica Urban, Mrs. Greta Vaught, and Mrs. Mary Rothwell typed it. Finally, for encouragement to write this history and for help in publishing it, I am indebted to the Department of Mathematics, to Mr. Irvin E. Youngberg, and to the Kansas University Endowment Association. To all of these I express my heartiest thanks.

G. Baley Price

Lawrence, Kansas
September 8, 1976

## Acknowledgements

Quotations--sentences, paragraphs, and also many complete articles--from *The Graduate Magazine* and its successors, *The University of Kansas Alumni Magazine* and *Kansas Alumni*, reprinted from volumes 1 (1902-1903) through 73 (1974-1975) with permission of the publisher, the University of Kansas Alumni Association, Lawrence, Kansas.

Quotations from articles in the *Lawrence Daily Journal-World*, and especially the complete article "Ephraim Miller's Recollections" (published May 25-27, 1925, and copyright 1925), reprinted with permission of the publisher, The World Company, Lawrence, Kansas.

The complete article entitled "Reminiscences of a Mathematical Immigrant in the United States", by Solomon Lefschetz, reprinted with permission of the publisher, The Mathematical Association of America, Washington, D. C., from the *American Mathematical Monthly*, vol. 77 (1970), pp. 344-350. Copyright 1970.

Quotations from articles in the *University Daily Kansan*, and especially from articles about the Fourth Annual Science and Mathematics Day (in 1955), about the disruption of the Chancellor's ROTC Review (in 1969), about the Kansas Union fire (in 1970), and about the disturbances and disruptions which followed the invasion of Cambodia (in 1970), reprinted with permission of the publisher at The University of Kansas, Lawrence, Kansas.

Biographies of forty-nine mathematicians, reprinted with permission of the publisher, R. R. Bowker Company, New York, N. Y., from *American Men of Science*, editions 1 to 11, 1906 to 1967. Copyright 1906 to 1967; the exact year of copyright for each biography is given following the biography in Appendix IX.

Contents

# Chapter 1

## The Pioneer Period

## 1866-1890

The University of Kansas sprang from the destruction and ashes of the Civil War, opening its first session in 1866; at the end of the century President Eliot of Harvard ranked the University of Michigan and The University of Kansas first among the universities in the West [Hyder 1, p. 268]. This meteoric rise presents a paradox, because the known facts about Kansas and the circumstances in which its University developed do not account for the heights of excellence and greatness this frontier University so quickly achieved. And still the paradox has an explanation: the University achieved greatness not because of favorable circumstances or great material wealth, but rather because of the qualities of the men and women who built it.
The faculty, students, alumni, and friends of The University of Kansas have possessed such intelligence, initiative, determination, persistence, courage, idealism, and selfless devotion to teaching and scholarship that they have succeeded in overcoming shortages of staff, buildings, and funds that have persisted throughout its history. Dean Olin Templin has said, "The heart of the true spirit of Kansas is just this,--*Allegiance to the Ideal*" [Templin 1, p. 7].

Kansas has always been a state of extremes and sometimes of violence. History records great droughts, the Dust Bowl period in the 1930's and dust storms that blacken the sky, but also the great floods of 1844, of 1903, and of 1951. The winters bring low temperatures, snow and occasionally severe blizzards, but the summers are nearly always hot--hot and humid or hot and dry. During my years at the University, Lawrence has experienced temperatures as low as -23°F. and as high as 117°F. Kansas is noted for its tornadoes--how but with the help of a Kansas tornado could Dorothy have reached the Land of Oz! Prairie fires were a scourge of the early settlers, and plagues of grasshoppers sometimes devoured their crops. And there have been times when the extremes of climate seemed to be reflected in the character of the people: John Brown, Populist politics, and Carry Nation are all part of the history of Kansas.

But as the United States pushed westward in the middle of the nineteenth century, herds of buffaloes roaming the state emphasized that Kansas possesses fertile river valleys, rich prairies and long growing seasons favorable to agriculture in spite of its extreme and unpredictable climate. Settlers began to move into Kansas as the slavery issue was approaching its climax; the area soon became the scene and object of a struggle between the North and the South, each seeking to win the territory and future state for its side. The abolitionists in New England entered the struggle with determination: Amos A. Lawrence, a Boston merchant and philanthropist, was one of those who supplied funds to send settlers to Kansas in an effort to make it a free state. On August 1, 1854, a band of these New England settlers camped on high ground in what is now Lawrence; they immediately named the hill Mount Oread after the Oread Institute in Massachusetts, which was also located on high ground overlooking its town [Taft 1, p. 2; Spring 1, p. 34]. The town was settled quickly, years of struggle and violence followed, and Kansas was finally admitted to the Union in 1861. Unfortunately, statehood did not bring peace and tranquility, for the Civil War had begun. Although there were no battles in Kansas between armies of the North and South, the state suffered greatly from border warfare and general lawlessness. The best example of this border warfare is known as Quantrill's raid. On August 20, 1863, Quantrill--an outlaw--crossed the Missouri line into Kansas with perhaps 175 mounted men and proceeded to Lawrence. The mayor had locked up all of the town's rifles in an effort to keep the peace. Quantrill surprised the defenseless town early on the morning of August 21, sacked and burned a large part of it, and killed 183 of its men [Taft 1, pp. 4-5; Spring 1, pp. 286-295].

The end of the Civil War in 1865 brought peace and reconstruction. Today we marvel that education and the establishment of a university were among the first concerns of a town that had suffered the ravages of border warfare for more than ten years. But immediately the caliber of the men and women of Lawrence exhibited itself in striking fashion; they built a university!

*The Graduate Magazine* contains a photograph of a portrait of Amos A. Lawrence presented to the University in 1931 by his granddaughter, Marion Lawrence Peabody [*The Graduate Magazine* 1, p. 2]. Beneath the photograph we read:

> Amos A. Lawrence, of Boston, who backed financially emigrant parties to Kansas to make the territory a Free State, and whose name was taken by the town he helped to found, was the first to start a movement for a college in the place. His gift of approximately $15,000 was the original benefaction to the University of Kansas.

## His Early Vision

In a letter dated Dec. 16, 1856, Amos Lawrence wrote to a friend in Lawrence, Kan.: "You shall have a college which shall be a school of learning and at the same time a monument to perpetuate the memory of those martyrs of liberty who fell during the recent struggles. Beneath it their dust shall rest. In it shall burn the light of liberty, which shall never be extinguished until it illumine the whole continent. It shall be called the 'Free State College' and all the friends of freedom shall be invited to lend a helping hand." Following this he makes his offer to help start the college and urges that friends of freedom everywhere join to make a fund of $100,000 with which to found the institution.

Although the Kansas constitution provided for a state university, it did not specify a location. Several towns sought to secure the institution, but on February 20, 1863, Governor Carney signed the bill locating the "University of Kansas" in Lawrence. Since the state legislature had made no appropriations for the University's support, contributions of land and money were solicited. The Episcopal, Congregational, and Presbyterian churches all tried to establish a university in Lawrence, but they did not succeed. The Board of Regents appointed the Reverend R. W. Oliver, minister of the Episcopal Church in Lawrence, as the first chancellor. Under his leadership, active work on the construction of a building began in the fall of 1865 and continued in 1866 on a foundation laid by the Presbyterian Church several years earlier. (This building came to be known as North College; it was located on the promontory where Corbin Hall, North College Hall, and Gertrude Sellards Pearson Hall--women's dormitories--now stand. A brief history of North College was published many years later when the building was finally abandoned as unsafe in January 1917 [North College 1, p. 142].) Rev. Oliver was born in Scotland in 1815. He had served as an officer in the British Army, but he had given up his military career to become an Episcopal clergyman.

As chancellor, he was not in any sense a member of the faculty: the Board of Regents had explained that Oliver was to preside over meetings of the regents and to act as a financial agent [Sterling 1; Ellsworth 1, part I; Taft 1, pp. 10-11; Hyder 1, pp. 100, 101, 104-105, 202, 255].

The University of Kansas opened its first session on Wednesday, September 12, 1866. Forty-nine students were present for the opening, but this number increased to fifty-five within a few days; there were twenty-six women and twenty-nine men. Not one of these students was ready for college work--all were in the preparatory department. The first faculty consisted of Elial J. Rice, President of the Faculty and Professor of Belles Lettres and Mental and Moral Philosophy; D.H. Robinson, Professor of Languages; and Francis Huntington Snow, Professor of Mathematics and Natural Sciences. Professor Rice, a graduate of Madison University in Indiana, had been a teacher in the Evansville public school before coming to The University of Kansas. He was forty-four years of age. Professor Robinson, a recent graduate of the University of Rochester in New York, was teaching in the Leavenworth public school in 1865; he was twenty-nine years old. Professor Snow was graduated from Williams College in 1862 and from Andover Theological Seminary in 1866; he had been trained primarily in ancient languages (Latin, Greek, and Hebrew) and in theology. He was twenty-six years old when he joined the faculty. The University's original staff, however, was soon to change. At the end of the first year, Professor Rice left to become President of Baker University. Shortly afterward, Chancellor Oliver left to become dean of an Episcopal seminary in Nebraska City. Thus, in 1867, the University found itself without either a chancellor or a president.

Francis Huntington Snow, the first instructor in mathematics at The University of Kansas, was born June 29, 1840, in Fitchburg, Massachusetts

[Hyder 1]. He was graduated from Williams College in 1862, having made a brilliant record and having been chosen valedictorian of his class. He taught in the high school in Fitchburg during 1862-1863, but was not entirely successful in this effort; Snow attributed his difficulties partly to a defect in his hearing. He entered Andover Theological Seminary soon afterward, but he was not long able to ignore the Civil War. Antislavery feeling in Fitchburg was strong, and a number of settlers had emigrated from Fitchburg to Kansas. F. H. Snow was strongly opposed to slavery, but he was also opposed to war, and for a time he suffered an inner conflict. He finally resolved the conflict by volunteering for non-military service with the Christian Commission. His duties involved him in a number of front-line experiences, and he was present at Lee's surrender at Appomattox. The war over, he returned to Andover Theological Seminary and was graduated on August 2, 1866. He was an ordained minister in the Congregational Church.

The election of Snow, a graduate of the distant but nationally famous Williams College in Williamstown, Massachusetts, to a position on the University's first faculty seems a mystery until the connections are explained. Dr. Charles Robinson, a leader of the free-state forces and an agent of the New England Emigrant Aid Company, was a friend of Snow's family and one of the Kansas leaders. Dr. Robinson had lived in Snow's home in Massachusetts for several years and had used a room there as his office. Elected Governor of Kansas under the Topeka constitution on January 5, 1856, Dr. Robinson appeared unexpectedly in Fitchburg on April 5, 1856, and an antislavery meeting in the town hall was quickly arranged for that evening by Snow's father [Hyder 1, pp. 18-19]. In 1865 Dr. Robinson, no longer governor but now a member of the Board of Regents of the proposed University of Kansas, initiated correspondence with F. H. Snow about an appointment to the faculty as Professor of Languages

[Hyder 1, pp. 94-95]. When the first faculty was finally elected on July 19, 1866 [Taft 1, p. 9], Dr. Robinson proposed Snow, but he was elected Professor of Mathematics and Natural Sciences rather than Professor of Languages as had been expected. Snow's personal acquaintance and close connections with the intellectual and educational leaders of New England--later expanded to those of the nation--were to prove a great asset throughout his life.

The 1866-1867 University catalog lists a four-year classical course and a four-year scientific course at the college level, but no students enrolled in these courses since all were in the two-year Preparatory Department. It may be remarked, however, that mathematics seems to have been an unfamiliar subject since Plain Trigonometry [sic] was listed as one of the subjects for the second semester of the college freshman year. The Preparatory Course included arithmetic in the first semester of the junior year, no mathematics in the second semester of this year, and algebra throughout the senior year. The "Requirements for Admission" state that

> Candidates for admission to Preparatory Department must be at least twelve years of age, and have a good common school education. . . .
>
> This Department will be discontinued at an early date. It is hoped that the Junior Class will be discontinued at the close of the present year, and the entire Department at the close of the following year. . . .
>
> Candidates for admission to the Collegiate Department must be at least fourteen years of age, and are expected to present satisfactory evidence of good moral character.

The University's enrollment increased to 105 in 1867-1868, but the hope of discontinuing the Preparatory Department was not realized: only two of the students were in the Collegiate Department. The other 103 consisted of 53 women and 50 men in the Preparatory Department. Furthermore, not only did the Preparatory Department not disappear, but it expanded into a three-year program with both a Classical Preparatory Course and a Scientific Preparatory Course. Of the nine terms in the three-year Classical Preparatory Course, three did not contain any form of mathematics but the other six contained arithmetic, elementary algebra, and four books of geometry. The three-year Scientific Preparatory Course included eight terms of arithmetic, algebra, and geometry, and one term of bookkeeping. At the college level, the University offered a Classical Collegiate Course and a Scientific Collegiate Course. The Classical Collegiate Course contained nine terms of mathematical subjects: university algebra, geometry, spherical geometry and plane trigonometry, spherical trigonometry and surveying, analytical geometry, calculus, mechanics and optics, astronomy, and logic. The Scientific Collegiate Course contained nine terms of mathematical subjects: university algebra, geometry, spherical geometry and plane trigonometry, spherical trigonometry and surveying, analytical geometry, calculus, mechanics and optics, astronomy, and astronomy with the use of instruments. In considering these courses, the reader should remember that the curriculum was a required one with no electives. There is little wonder that few students could qualify for enrollment in the Collegiate Department. For many years The University of Kansas was referred to as the Douglas County High School, partly because so many of its students were enrolled in the Preparatory Department, and partly because so many of its students came from Douglas County. To its great embarrassment, in the early days the University was also frequently called a "little Lawrence high school" [Sterling 1, p. 168].

In 1866 Kansas was new and unexplored territory for the naturalist, and Professor Snow became an energetic collector immediately on his arrival in Lawrence [Hyder 1, ch. 6; Snow 1]; he collected geological specimens (rocks and fossils), reptiles, birds, mammals, and insects--especially insects. Snow was Professor of Mathematics and Natural Sciences; the record indicates that he discharged his responsibilities for mathematics, but his heart was clearly in the natural sciences from the beginning. The teaching of large classes of students in high school arithmetic, elementary algebra, and geometry did not have the appeal of a research program in regional geology, paleontology, meteorology, entomology, and so on. Snow's development of the natural sciences at The University of Kansas proceeded so rapidly that he was soon able to ask to be relieved of his responsibility for mathematics. But a new chancellor had arrived before this event took place.

The new chancellor was General John Fraser. Professor Ephraim Miller, writing many years later [Miller 1, pp. 123-124], described him.

> General Fraser was born in Scotland and educated at the University of Aberdeen. He was a man of wide culture, a classical scholar, a good mathematician, and of fiery disposition. That hot temper of his often led him into wordy disputes with members of the faculty. He could not endure any criticism of his official conduct, and as a consequence bickerings and accusations became very frequent during the last year of his administration. At a meeting of the faculty, in the fall of 1874, a hot discussion arose over the publication of the next annual catalogue. There was a wordy duel between the Chancellor and Professor Smith. Smith desired to know how many of the students' names would appear in the printed lists. The Chancellor replied that the aggregate would reach a certain number. Then Smith, rising to his feet, asked how many of that number were actual students of the University for the current year. The answer was given in an angry tone that the number was about a hundred less than the catalogue list, it being the custom to insert in the catalogue the names of students who had entered the University since the

preceding January first. By this time Smith was red hot, too. Raising his voice a little, he said: "I wish that there was honesty enough in the University of Kansas to secure the publication of a catalogue that would tell the truth, the whole truth, and nothing but the truth." It was because of such quarrels that the Board of Regents requested the resignation of every member of the faculty, including the Chancellor. The object of the Board was to secure a harmonious and united faculty by means of reorganization. Snow, Robinson, Bardwell, and Smith were reelected.

The retiring chancellor, General Fraser, was not a teacher in the American sense. In the business of teaching, he was a lecturer, and seemed to be ignorant of the fact that preparatory students needed teachers and not lecturers. At one time he had charge of a class in algebra. His method of lecturing before the class failed to fit the case. The boys and girls soon learned that their teacher was shooting over their heads, and in accordance with the habits of boys and girls under such circumstances,--at any rate those of the American species--whisperings, gigglings and notes became very common. With increasing momentum, this state of affairs continued, until the attention of the General was attracted by the disturbances going on. Once he stopped short in the middle of the hour, very much excited. Turning to the class, he began to lecture them on the proprieties, closing with the remark, "Now young ladies and young gentlemen, if you should ever go to heaven and meet me there, how would you feel, and what will you say, when you remember your conduct in this class room?"

A quite different view of Chancellor Fraser is given by S. A. Riggs [Fraser 1 pp. 117-123; S, ch. 1, sec. 1], one of Fraser's students in an earlier period. The difference in views may be accounted for in part by the difference in time and circumstances. Furthermore, the relationships of Riggs and Miller to Chancellor Fraser should be noted: Riggs was his student, but Miller was not even a member of the faculty of The University of Kansas when Fraser was chancellor. Although he was in Lawrence as the Superintendant of Schools, Miller was not appointed to a position in the University until the fall of 1874. By that time, Fraser had left; Miller's statement that the episode at the faculty meeting occurred in the fall of 1874 is an error. The following is an excerpt from Riggs' account of Chancellor Fraser.

> Mentally he was alert and strong, with the characteristics resulting from the thorough training and discipline of the Scotch universities, and he gave himself to the work of teaching with a zeal and enthusiasm that knew no fatigue. He loved the work of the teacher, an essential to the highest success in that line of effort. He never drifted.
>
> As an instructor, he had a grasp of the principles of the higher mathematics, and their practical application, that seemed absolute, and his class-room explanation of them was so clear and simple as to be fascinating. . . . His uniform friendly courtesy found a ready and appreciative response from the students.
>
> He had a generous tolerance and sympathy for the student who, from a lack of natural ability or aptitude, or from insufficient preparation for advanced work, was lagging and discouraged; and it was his habit to spend his evenings with such pupils, assisting and encouraging them in their school work. While I have no doubt that the professors in the University of Kansas are in the habit of rendering such aid and comfort to the struggling weak among their students, I am free to say that, in my college days, the conduct of Professor Fraser in this regard was entirely exceptional, and made a deep impression on me.
>
> . . . When he entered the duties of chancellor of the University of Kansas, he found enrolled about one hundred and twenty students, only six of them in college classes, and a building equipment consisting of the North College at the north end of Mount Oread. Realizing the impossibility of successfully conducting the work of the school in such narrow quarters, he urged upon the Board of Regents, at their meeting on the first of December, 1869, the necessity for new and more commodious buildings. . . . Chancellor Fraser found the school a preparatory school, located in a building inadequate for the work it was then doing. He left it housed in a beautiful and commodious building, said to have been the largest school building in the country at that time, with college classes fully organized and doing work appropriate to a university course. This changed condition was brought about during a period when Kansas was in its most depressed financial condition, and before the people of the State at large were aroused to the importance of the school. . . . His successors have enjoyed the benefits of his work, a constantly growing interest in the University on the part of the people of the State, and a greater liberality on the part of the legislature in providing for it.

> . . . The great work of Chancellor Fraser [was accomplished] under most trying conditions. . . . Worn by the burdens and anxieties of his office, and irritated by the known efforts that were being made by a member of the faculty to destroy his influence and supplant him in the chancellorship, he may have carried into his administration of University affairs too much of the rigidity of military rule, and too little of the tact necessary in dealing with an inharmonious faculty; but the conditions that led to his resignation were not wholly of his making, and his friends, and the friends of the University throughout the State, who had followed closely the development of the University, believe that a great injustice was done him in the manner of his removal.

Hannah Oliver was a student in the University during the administration of Chancellor Fraser. Many years later she wrote an appraisal of him [Fraser 2] which supplements nicely the accounts by Ephraim Miller and S. A. Riggs. Fraser taught while he was chancellor, and Miss Oliver gives a kindly account of him as a mathematician and teacher. Chancellor Strong [Strong 1, pp. 7-9, 28-30] and Fred Ellsworth [Ellsworth 1, part I, p. 8] have given evaluations of Chancellor Fraser's administration. Ellsworth wrote:

> Gen. Fraser did more than build a building. Someone wrote of him: "his vigor, intellectual strength, high character, and purpose exerted a large influence in the state." It must be remembered that the University at first was chiefly a Douglas County high school. Fraser attracted attention over a wider area.

When an opportunity came for Chancellor Fraser to increase the faculty, Professor Snow requested that he be relieved of mathematics so that he could devote all of his time to work in the natural sciences; the regents agreed in July 1869 [Sterling 1, p. 91; Hyder 1, p. 131]. As a result, the catalog for 1869-1870 gives Snow's title as "Professor of Natural Sciences", and

Snow henceforth had no connection with the teaching of mathematics at The University of Kansas. There is no evidence that Snow, as a professor, had any influence on the development of mathematics or of the Department of Mathematics; however, he played an important role later as chancellor [S, Appendix IX, Snow].

Frederic W. Bardwell (1832-1878), Snow's replacement in the field of mathematics, taught mathematics and began the development of engineering in the University; he was appointed "Professor of Mathematics and Engineering" beginning with the academic year 1869-1870 [Hyder 1, pp. 131-132; Taft 1, p. 33; Sterling 1, pp. 196-197]. Bardwell held a B.S. degree, having been educated at the Lawrence Scientific School at Harvard. As a colonel during the Civil War, he commanded a regiment of Negro soldiers. He had taught in Antioch College in Ohio, and he had also held a position in the Naval Observatory in Washington, D.C. Dean F. O. Marvin, in his history of the School of Engineering [Marvin 1, pp. 197-204], praised Bardwell for his teaching of engineering and for his contributions to the development of a program in this field in the University.

> He was a man of fine character and personality, and especially strong along mathematical and astronomical lines. . . . As a teacher he was so successful that the few young men who fell under his training as engineers were able to win a professional standing of exceptionally high grade. Undoubtedly Professor Bardwell's belief in the value of this kind of training was the chief reason for retaining an engineering curriculum during the years of great discouragement.

Professor D.H. Robinson, Professor of Languages and a member of the original faculty of three in 1866, described Professor Bardwell in his "Reminiscences" in Sterling's *Quarter-Centennial History* [Sterling 1, p. 196].

> The appointment of Professor F.W. Bardwell at the end of the third year to the Chair of Mathematics and Engineering was a great relief to Professor Snow, and also a great gain to the University. Professor Bardwell was a man of superior ability, a hard student, a successful teacher, and popular with his pupils.
>
> He was also of quite an inventive turn of mind. On several occasions he obtained patents. His last was a water wheel, by means of which he was sure that ships could cross the ocean in from one to two days less time than is now required. This invention he died without perfecting.
>
> He also published an arithmetic, which is said to have had considerable merit, but owing to his death soon after, it was never revised nor pushed into notice.

Bardwell was given assistance in the field of engineering in 1871 by the appointment of A. J. S. Molinard, a graduate of the U.S. Military Academy, as "Professor of Engineering and of General and Industrial Drawing". Molinard, however, left at the end of the academic year 1871-1872. His place was taken the following year by S. W. Y. Shimonsky, a graduate of the Polytechnical School in Berlin, Prussia, who held the title "Professor of Engineering and General Industrial Drawing" during the academic years 1872-1873 and 1873-1874. With others taking responsibility for engineering, Bardwell's title since 1869--"Professor of Mathematics and Engineering"-- was changed in 1872 to "Professor of Mathematics and Astronomy". Although Bardwell held this title through 1874-1875, troubles of several kinds had overtaken the University, and in 1874 a general reorganization of the faculty became necessary.

Kansas troubles seldom come singly: just as the Great Depression of the 1930's was accompanied by the drought of Dust Bowl fame, so also the financial panic of 1873 was accompanied by hordes of locusts. Professor F. O. Marvin described the situation [Marvin 1, p. 199].

> In 1872 came "Black Friday" on Wall Street, which was followed by the most disastrous panic that this country has experienced,the puncturing of inflated schemes, the death of ill-founded hopes, and the abandonment of public enterprises calling for the services of engineers. This panic was much more than a flurry of high finance on Wall Street, for its effect was felt in general business all over the land. Banks failed, industries found no market, confidence was gone, and activity paralyzed.
>
> Yet more keenly felt in Kansas was the coming of hordes of locusts that swept the state, ruined its crops and shattered the hopes and confidence of its people.
>
> As a result of these events, the University authorities found themselves confronted with a serious situation in the fall and winter of 1874. The legislature of that year, feeling the poverty of the people, refused the University's requests, small as they were, and cut its budget to such an extent that the Regents could not fulfill some of the obligations they had already made.
>
> The University was forced to abandon, for the time being, any idea of building up a distinctive engineering department. The chair was left vacant and the technical work again placed under Professor Bardwell's direction as an addition to his other work. The curriculum was maintained, however, although changed to suit the new conditions, and one engineer was graduated in 1875.

"Black Friday" and the panic that followed was one of the contributing causes that led to the resignation of Chancellor Fraser. In his account of Fraser, Fred Ellsworth [Ellsworth 1, part I, p. 8], has said, "Furthermore, he simply did not have the ability or desire to retreat or retrench. When the Legislature cut yearly operating funds from $36,000 to $24,000, he was lost." As a result of Fraser's quarrel with his faculty and the regents, the regents asked for the resignation of the chancellor and the entire faculty

[Hyder 1, pp. 135-136; Miller 1, pp. 123-131 (quoted above)]. Only Bardwell, Robinson, Byron Caldwell Smith, and Snow were reappointed. Thus, the resignation of Chancellor Fraser in 1874 became the occasion for a general reorganization of the faculty and a retrenchment as required by the reduction in appropriations by the legislature.

Fraser's departure necessitated appointment of a new chancellor [Hyder 1, pp. 170-175; Taft 1, p. 19]. The Reverend Dr. James Marvin, the University's third chancellor, was a clergyman and Professor of Mathematics in Allegheny College in Meadville, Pennsylvania, when he was selected as Fraser's successor. Ellsworth wrote a brief account of Marvin's administration [Ellsworth 1, part I, pp. 8, 22-23]:

> The Rev. Mr. Marvin came in December 1874 to take over the Chancellorship, with a background as a Methodist minister who had been teaching in Allegheny College, also in Pennsylvania. He was a man of medium height, taller than Fraser, and had even longer whiskers than did his predecessor.
>
> It was Marvin's misfortune to face discouraging conditions. The financial collapse following the silver panic of 1873 affected the whole country for several years. In Kansas, droughts and repeated invasions of grasshoppers caused hundreds of settlers to leave the state. Chancellor Marvin himself served willingly at a reduced salary, and induced other faculty members to do likewise.
>
> Somehow, he got the Legislature to vote $35,000 to finish the grand new building, and from inferences in various writings of the time, it is apparent that he later got faculty salaries substantially increased. He had the grounds graded and caused grass to be sown. He installed a hedge fence on three sides of the main building and a stone wall with an iron gate on the other--to keep the wandering cows away. Among the plantings was the now famed lilac hedge, and Marvin Grove in the hollow below the place where Green Hall now stands.
>
> The new Chancellor managed to eke out funds for a small building for chemistry--in order to get the fumes and danger of fire from the laboratories out of the basement of the main building.

> There was a continuing urge to rid the University of the preparatory department. Chancellor Marvin followed a reasonable course to that end by mapping out an adequate high school course and getting schools over the state to adopt it--beginning with Lawrence, where his son was principal.
>
> The Rev. Mr. Marvin gradually added courses in the University curriculum and brought in new faculty members, a major percentage of whom turned out in later years to be the stalwarts of the teaching staff. Marvin's own son, Frank O. Marvin, started engineering studies, and was made dean of engineering in 1891, when that school was organized. He will be remembered forever as an academic patriarch. Likewise, James Woods Green, who started teaching law in 1878. Under Marvin, Prof. Frank Snow was let free and encouraged to start courses in botany, entomology, geology, and zoology, and to begin his scientific expeditions with groups of students.
>
> By 1883, this modest man, the Rev. Mr. Marvin, who had been a second choice and had been elected Chancellor in a rather haphazard manner, finished his tenure with a fine record. Enrollment had grown from 173 in 1874 to 582, and the University's position in the state was solidly improved.

Hyder has stated that "Chancellor Marvin's most important achievement was the strengthening of the faculty" [Hyder 1, p. 171]. In addition to James W. Green, who became Dean of the School of Law, examples of Marvin's appointments are James H. Canfield, Professor of History and of the English Language and Literature (later President of the University of Nebraska and of Ohio State University, and Librarian of Columbia University); Arthur G. Canfield (cousin of James H.), Professor of Romance Languages; L. W. Spring, Professor of English (his history of Kansas was written while he was on the faculty); J. Willis Gleed, instructor in Latin and English, and later lecturer in the School of Law; and William Herbert Carruth, teacher of modern languages and later of German only. But Chancellor Marvin was not responsible for the most important faculty appointment in mathematics in this period: Ephraim Miller had been appointed at the close of Fraser's administration.

Miller is listed as "Assistant Professor of Mathematics" in the supplement to the 1873-1874 University catalog dated September 1874; Chancellor Marvin did not assume his duties as chancellor until December. Ephraim Miller was one of the giants in the early history of The University of Kansas; an account of him will be given after the record of the connections between mathematics and engineering in those early years has been completed.

Shimonsky departed after the reorganization of the faculty in 1874. The catalog for 1874-1875 states that Bardwell--although his title was still "Professor of Mathematics and Astronomy"--was in charge of the work of engineering. In 1875-1876 Bardwell's title was changed to "Professor of Astronomy and Civil Engineering", a title he kept during the following year. Frank O. Marvin is listed in the 1875-1876 catalog as "Assistant Professor in Preparatory and Normal Departments", but Marvin himself states in his *American Men of Science* biography [Marvin 2; S, Appendix IX, Marvin] that he was an instructor in mathematics and physics; Marvin held this position for one year only. Bardwell's title in 1877-1878 was "Professor of Astronomy, Civil Engineering, and Free Hand Drawing". Bardwell died in the summer of 1878; the circumstances surrounding his death have been described by Professor D. H. Robinson [Sterling 1, p. 197].

> His last work for the University was a summer trip to Colorado in 1878, to take observations on the total solar eclipse that year. Professor Frank O. Marvin and I went as his assistants. He was in ill health before starting, but in that bracing atmosphere expected soon to recover. Leaving him at Manitou we made a ten day's trip in the mountains. On our return, instead of finding him better, as we expected, we found that, growing rapidly worse, he had packed up his instruments and gone home several days before our arrival. A few days later he died. In his death the University lost an able professor and a most excellent man.

Frederic W. Bardwell was the second instructor in mathematics in The University of Kansas (Snow had been the first). Bardwell was a teacher of the subject, and there is no evidence that he influenced the development of mathematics in the University.

In the fall of 1878, following Bardwell's death, Ephraim Miller was asked to take charge of engineering temporarily; later in the fall [Marvin 1, pp. 197-204] Herbert S. S. Smith was appointed "Professor of Physics, Astronomy, Civil Engineering and Free-Hand Drawing". The connections between mathematics and engineering, however, were not severed; the catalogs for 1878-1879 through 1881-1882 list Frank O. Marvin as "Assistant Professor of Mathematics, Physics, and Civil Engineering" [S, Appendix IX, Marvin]. Marvin was the University's fourth instructor in mathematics since Ephraim Miller's appointment antedated Marvin's by one year. In 1882-1883 Marvin became "Professor of Civil Engineering" and thereafter had no further connections with mathematics. Herbert S. S. Smith took over the teaching of astronomy in 1878, and the Department of Mathematics relinquished official responsibility for this subject until 1891. In the meantime, astronomy was taught by Smith, E. L. Nichols, and Lucien Ira Blake, in connection with physics.

Professor F. O. Marvin was born in Alfred Center, New York on May 27, 1852. He received A.B. and A.M. degrees in 1871 and 1874, respectively, from Allegheny College where his father, Chancellor James Marvin, had been Professor of Mathematics. The experience F. O. Marvin gained from several years spent in the field as a civil engineer helped him as a teacher of engineering. He was also an accomplished amateur artist, etcher, and organist. Robert Taft [Taft 1, p. 54] has reproduced one of Marvin's drawings of the organ in Plymouth Congregational Church--an organ which Dean Marvin played for many years. Marvin died on February 6, 1915, and Professor H. E. Riggs--

a graduate of The University of Kansas and for many years a distinguished Professor of Engineering at the University of Michigan--wrote an account of his life and work for *The Graduate Magazine* [Marvin 3, pp. 140-143]. Riggs said, "Professor Marvin's life work was the establishment and building up of the School of Engineering." Clearly Dean Frank O. Marvin was one of the giants in the University, but his contribution was the development of the School of Engineering. There is no evidence that he influenced directly the development of mathematics.

Ephraim Miller was the third person appointed to teach mathematics in The University of Kansas following Snow (appointed in 1866) and Bardwell (1869) and preceding F. O. Marvin (1875). Miller became Assistant professor of Mathematics in September 1874, and by the end of the academic year 1874-1875 he had been promoted to Professor and placed in charge of mathematics. He played a dominant role in mathematics for thirty-six years from the time of his first appointment in 1874 until his retirement in 1910; he was the first member of the faculty who influenced the development of mathematics in the University [Miller 2; S, Appendix IX, Miller].

Ephraim Miller was one of the important men in the early history of the University; his contributions were significant for the entire University as well as for the Department of Mathematics. This fact alone would justify a more detailed account of his life. But in addition, those who have written about The University of Kansas have almost completely ignored its mathematicians. For example, Sterling barely mentions the appointment of Miller in 1874 [Sterling 1, p. 96], and he has nothing further to say about him, although Carrie M. Watson mentions his work as University Librarian [Sterling 1, pp. 104 and 120]. Taft gives a picture of the faculty for 1892-1893 which includes Miller [Taft 1, p. 44], but there is no further account of Miller or of his work. In his biography of Snow, Hyder mentions Miller twice [Hyder 1, pp. 173-174, 202], but these are only incidental references. Henry Byron Newson, the University's first research mathematician, is not mentioned at all by Sterling or Hyder, and Taft states only that Newson was missing when the photograph of the 1892-1893 faculty was made [Taft 1, p. 44]. Griffin's recent history of the University [Griffin 1] contains some information about Miller and a few other mathematicians.

Ephraim Miller was born on April 25, 1833 in a log cabin near Carrolton, Ohio [Miller 6]. He exhibited early an interest in, and aptitude for, learning; he went to school before he was five years old. School programs were simple in those days, and "his athletics consisted of a walk of four miles to and from school." When he was twelve years old, he entered the academy in Carrolton. Miller began his teaching career early; after attending the academy for just two years and while he was fourteen years old, he taught in a log house which was not over fifteen feet square. His pupils were "an aunt or two, an uncle, his cousins, and two or three young men." Miller received five dollars for teaching four months in this school.

Miller had established a reputation as a good student, for about this time a neighbor offered him a $100 scholarship which he controlled at Allegheny College in Meadville, Pennsylvania. The scholarship was offered to Miller for four years, and he accepted it immediately. When he left home to begin the trip to Allegheny College, he had $35 in his pocket, including the $5 he had earned teaching school. A description of the trip from Miller's home to Allegheny College emphasizes the changes in transportation which have taken place since that time. He began the journey to Pennsylvania in a stage coach drawn by four horses; at Steubenville on the Ohio River, however, he took passage on a steamboat for Pittsburgh, and from there to Meadville, where he entered Allegheny College. Evidence suggests that the year was 1848, when Miller was fifteen years old, but the date is uncertain.

Miller's first-year studies consisted of rhetoric, algebra, Latin, and Greek. The year was a difficult one because he lacked adequate funds to pay his expenses. At the end of the year he and several other students went to New York State to work in the harvest fields to earn money to continue their studies. During the next year, Miller taught school not many miles from the College. The record is not clear, but Miller probably was not a student during this year. He received $10 per month for teaching twenty-six days per month, and he boarded a week at a time at the homes of patrons of his school. Miller maintained some connection with Allegheny College, however, because he met the Greek classes when the professor of Greek was not able to do so. Miller continued to teach and to work at all kinds of odd jobs to earn his expenses.

It is not possible to account for all of the time between Miller's entrance to college and graduation, but the record does show that 1852-1853 was his junior year. He completed his junior year in good shape, but after giving $80 to his father, who was an invalid and very poor, Miller's funds were exhausted and he was again forced to look for a job.

A brother of Miller's roommate was principal of a ward school in New Orleans. The brother offered the roommate a teaching position in his school, but the roommate decided to remain at Allegheny College to complete his senior year. Miller went to New Orleans and succeeded in obtaining the position. Miller was paid $840 for teaching during the academic year 1853-1854.

Even in his old age Miller recalled vividly many of his experiences in New Orleans. Discipline was always a problem--and teachers were sometimes assaulted by the parents of pupils who had been disciplined. New Orleans suffered its worst yellow fever epidemic during the summer of 1853, and Miller described burials of the dead in mass graves [Miller 6]. Dueling was still common. Some antislavery literature circulated secretly, and Miller obtained a copy of *Uncle Tom's Cabin* which he promptly read. *Uncle Tom's Cabin* described a hotel in the southern part of New Orleans where slaves were bought and sold. Miller visited the hotel a week later and saw Negro boys auctioned off at $1600 each and a woman with little girls auctioned for $1900. He also had intimate knowledge of some of the brutal treatment received by slaves.

When the year ended, Miller returned to New York on the ocean steamer *Daniel Webster*, a steamer which later carried supplies to Charleston, South Carolina at the beginning of the Civil War. In September 1854, Miller reentered Allegheny College as a senior. He had saved $400 from his New Orleans teaching salary, but he gave $100 of this to his father. Although his year in New Orleans had been profitable, Miller worked as hard as ever during his senior year. During the winter term he boarded with a farmer and taught the farmer's three children from two to five o'clock each afternoon. In the evening Miller studied his own lessons. He arose at 5:30 each morning, ate his breakfast, and walked four miles to the College to begin his first classes at 7:30 a.m. Miller graduated with the senior class in 1855. There were twenty-two students who graduated that year, and in 1925 Ephraim Miller was the only survivor.

Miller was married, ten days after graduation, to Miss Eliza Campbell, a cousin of the President of the University of California, W. W. Campbell. He thus had a degree, a bride, and $50, but he needed a job which would provide a regular income. When Allegheny College was asked to recommend someone for the position of superintendent of city schools in Youngstown, Ohio, the President recommended Ephraim Miller, who was appointed. He was not very successful as superintendent during the year 1855-1856, however, and he did not seek reelection. During the years from 1856 to 1859, Miller made a reputation for himself as a teacher in suburban schools in northwest Ohio, and in 1859 he was elected superintendent of schools in Findlay, Ohio. In 1860 his wife died, and two years later he married Miss Anna Antrim Hoge. Successful as superintendent this time, he held the Findlay position until 1870, when he resigned to become superintendent of schools in Lawrence, Kansas. Miller did not mention the years from 1855 to 1859 in his biography in *American Men of Science*, First Edition (1906) [Miller 2; S, Appendix IX, Miller], but newspaper accounts published at the time of his death in 1930 supply some details [Miller 3]. Miller moved with his family to Lawrence in August 1870, and immediately his life became entwined with the historic events in the young University of Kansas. William Herbert Carruth and J. W. (Willis) Gleed were his students at the Lawrence High School [Hyder 1, pp. 173-174]; the three soon became famous as members of the faculty of The University of Kansas.

Ephraim Miller was appointed Assistant Professor of Mathematics in the University at the time of the faculty reorganization which accompanied Chancellor Fraser's departure and the severe cuts in the University's budget. There was nothing in Miller's background except the pioneer virtues of frugality, hard work, and devotion to duty to suggest that he would become the creator of a significant Department of Mathematics. Looking back on his career in 1925, Miller said that between 1855 and 1925 he had been a wood chopper, a harvest hand, a would-be-farmer, a common school teacher, a superintendent of schools, Professor of Mathematics and Astronomy at The University of Kansas for thirty-six years, Emeritus Professor of Mathematics and Astronomy for fifteen years, and a pensioner of the Carnegie Foundation for fifteen years [Miller 6; S, Appendix I]. It may be remarked parenthetically that the University catalog for 1891-1892 is the first one which gives Miller the title of Professor of Mathematics and Astronomy.

The time has now come to describe how Ephraim Miller undertook the task of building a Department of Mathematics in The University of Kansas. An account of the courses of study and of the state of mathematics in the University at the time of Miller's appointment in 1874 provides a background for understanding Miller's work.

The organization of the University and the various courses of study which Professor Miller found when he joined the faculty in 1874 are described in the catalog for 1874-1875. The University was divided into a Collegiate Department with six courses of study and a Preparatory Department with three courses of study. The work in mathematics in the Collegiate Department included algebra, trigonometry, analytic geometry, and differential and integral calculus. Astronomy occupied a prominent position, because each of the six courses of study required either one or two semesters of astronomy. The work in mathematics in the Preparatory Department consisted of arithmetic, algebra, and geometry; it is worthy of note that the classical course, the scientific course, and the modern literature course each required one year of arithmetic, one and one-half years of algebra, and one semester of geometry (the first Five Books!) [S, ch. 1, sec. 2].

For the three years 1875-1876, 1876-1877, and 1877-1878 Miller was the only instructor in mathematics. In his report to the Board of Regents dated November 15, 1875, Miller described his work during the preceding academic year. The complete report follows.

> The annual report of this chair, as required by statute, is herewith submitted. During the past year instruction was imparted to the middle and senior classes of the preparatory

department, and to the freshman and sophomore classes of mathematics, and to the freshman, sophomore and junior classes in history and English literature. The labor, although excedingly [sic] hard, was performed, and the results were beyond my expectations. The chair of mathematics is now exclusively under my own care. Life, energy and thought are manifesting themselves daily in the class-room, and as a consequence, among some of the students the question of a special mathematical course has already been broached. With your permission, therefore, I shall, at some future time, not very remote, ask that such a course be established.

The classes and the number of students in each that recite to me at present are as follows:

| | |
|---|---|
| Junior preparatory in higher arithemetic | 63 |
| Middle preparatory in elementary algebra | 62 |
| Senior preparatory in higher algebra | 33 |
| Freshman class in higher algebra | 40 |
| Sophomore class in trigonometry | 21 |
| Junior class in calculus | 4 |
| Total | 223 |

I hear twenty-four recitations per week. The text-books used and to be used the current year are Robinson's higher arithmetic, Olney's algebras, Schuyler's geometry, and Olney's trigonometry, general geometry, and calculus.

The following is the complete report which Ephraim Miller submitted to the Board of Regents in 1878.

The attendance of students in the lower classes was so large that other classes in higher arithmetic and algebra were organized and placed under the charge of members of the junior collegiate class. To do justice to such students as enter poorly prepared, classes in elementary mathematics should not consist of more than twenty-five each.

In the collegiate course, the work required of the undergraduate is as follows: The Freshmen complete algebra and geometry, the latter including a chapter on transversals and modern geometry. The Sophomores finish plane and spherical trigonometry and analytical geometry. The Juniors, with whom the present mathematical course ends, are required to complete all that is included in Olney's Calculus or Loomis's revised

> edition. Students are encouraged to examine such authorities as Chauvenet, Todhunter, Price, Salmon, and others, English and American.
>
> In pursuance of a suggestion made in my last report, an advanced course in mathematics is being prepared for those who may desire it. Throughout the entire course the student is required to study the art of orderly and intelligible arrangement, to accustom himself to the application of the principles of geometry, trigonometry, etc., and to remember and use the formulae for reductions, transformations, and their applications to all kinds of equations. Suitable exercises, original and selected, are provided first to last.

As Miller's reports make altogether clear, he had a very large number of students to teach. He had other burdens as well. Following F. W. Bardwell's death in the summer of 1878, Miller was asked to take charge of engineering temporarily. Furthermore, Ephraim Miller became University Librarian on January 1, 1875--a position he held until April 1, 1887 [Sterling 1, p. 104]. Clearly Professor Miller needed help, and it was forthcoming first of all in the appointment of Professor F. O. Marvin. The *Journal of the Board of Regents* contains the August 21, 1878 report from its committee on instruction. Noting "that as the time previous to the opening of the next session [was] so short" and that they were "unable to fill the chair [of astronomy and engineering] at present", the committee recommended "that F. O. Marvin be employed temporarily as Instructor to assist Prof. Miller and others who may give instruction required in Prof. Bardwell's department". The Board of Regents agreed.

Marvin proved to be highly successful, and the *Journal of the Board of Regents* records that, at the meeting of June 10, 1879, held in the Ludington House in Lawrence, F. O. Marvin was elected Assistant Professor of Mathematics, Physics, and Civil Engineering at an annual salary of $1050. He was reelected again in 1880, at a salary of $1200. These salary figures are useful for comparison with salaries in later years. The University catalogs list F. O. Marvin as Assistant Professor of Mathematics, Physics, and Civil Engineering for the four year period beginning 1878-1879 and ending 1881-1882.

Ephraim Miller submitted his next report to the Board of Regents in 1880. The complete report follows.

I have the honor to submit the second biennial report of the Department of Mathematics. The class register furnishes the following statistics.

1878-79

| Class | No. |
|---|---|
| Junior Preparatory, Arithmetic | 59 |
| Middle Preparatory, Algebra | 108 |
| Senior Preparatory, Geometry | 54 |
| Freshman, Algebra | 38 |
| Freshman, Geometry | 36 |
| Sophomore, Analytical Geometry | 23 |
| Junior, Calculus | 9 |

1879-80

| Class | No. |
|---|---|
| Middle Preparatory, Algebra | 87 |
| Senior Preparatory, Geometry | 46 |
| Freshman, Algebra | 41 |
| Freshman, Geometry | 37 |
| Sophomore, Trigonometry | 26 |
| Sophomore, Analytical Geometry | 19 |
| Junior, Calculus | 8 |

Reviewing the work, from its inception until the final results were reached, I may safely say that more real success, greater proficiency and more substantial scholarship have been achieved, than during any other equal period of time of which I have any knowledge. It gives me special pleasure to state that among the most promising students were several young ladies, who not only kept pace with the best of their classes, but actually carried off the highest grade marks. Life, activity, enthusiasm and class-spirit characterized the recitations. Difficult problems, propositions and demonstrations were thoroughly discussed and mastered. The bald statement of a proposition in the text-book, or by the teacher, was sure to be questioned, often resulting in a keen and clear analysis of all its points. Original demonstrations of given propositions were encouraged, and some good examples produced.

The text-book, when possible, was excluded from the room, and in geometry particularly, the diagrams of the book were often so changed as to require a new order of demonstration. Thus, primarily, the reasoning faculties, imagination and memory in its legitimate sphere, were trained to correct modes of operation--students being taught that the mere memorizing of propositions by number and by book, and the chattering of words and sentences, just as memory and not reason furnished them, were but a useless waste of time, and subserved no valuable purpose whatever.

Examinations were held at intervals during term-time, as well as at the close. Notice of such examinations was purposely withheld, in order that the students, thrown entirely upon their own resources, might be as free as possible from that plague of the school-room--*cram*. Clearness of statement, logical order, and good English, were insisted upon. In the great majority of papers thus prepared, very satisfactory results were attained.

One serious difficulty, met at every step of the elementary work of this department, whether in recitation or examination, is a lack of analytical imaginative power. To construct a geometrical figure, with its necessary auxiliary lines, from the mere enunciation of a proposition, is to beginners a task of immense proportions. Inventional geometry should be taught in the public schools. It might be substituted for elementary geology and entomology; for it is a notorious fact that of all the attempts to improve those schools, not one has been so barren of solid results as the two subjects just named. Human beings, as well as horses, should be kept clear of the risk of exhausting their strength in premature races.

Herbert Spencer, writing of a little book published by his father, says: "Though the 'Inventional Geometry' received but little notice when first issued here, recognition of its usefulness has been gradually spreading, and it has been adopted by some of the more rational science-teachers in schools. To its great efficiency, both as a means of producing interest in geometry, and as a mental discipline, I can give personal testimony. I have seen it create in a class of boys so much enthusiasm that they looked forward to their geometry lesson as a chief event in the week; and girls initiated in the system by my father, have frequently begged of him for problems to solve during their holidays."

The inventional faculty can be immeasurably improved by a skillful mode of instruction. Architecture, engineering, surveying, astronomy, navigation, the physical application of the calculus, especially to crystallography, to geometrical optics, and indirectly to the induction of currents, to electrodynamics, etc., all depend very largely upon geometry. More time should be given to so important a subject. Newton said: "I keep the subject constantly before me, and wait till the first dawnings open by little and little into a full and clear light."

There seems to be in certain quarters a repugnance to the science of mathematics, and severe and sharp animadversions have been made to belittle it; and so far has this been carried, that even students of fine mathematical powers are induced to look upon it as an unmitigated evil. Macaulay, writing from Cambridge to his mother, of his hatred of mathematics, exclaims: "Farewell, then, Homer and Sophocles and Cicero. Farewell, happy fields, where joy forever reigns! Hail, horrors, hail, infernal world! Milton's descriptions have been driven out of my head by such elegant expressions as the following:

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots$$

$$\tan (a + b) = \frac{\tan a + \tan b}{1 - \tan a \tan b}."$$

But when the sober second thought came, as it did in the later years of his life, he writes: "I often regret, and even acutely, my want of a senior wrangler's knowledge of physics and mathematics; and I regret still more some habits of mind which a senior wrangler is pretty certain to possess." The study of mathematics certainly requires long-continued effort in combatting its difficulties; but it is not a question, and men of the most scholarly attainments will coincide in this opinion, that "the path in mathematical science is more rugged than that trodden by the student of a dead language."

Sir J. Herschel says: "Admission to the sanctuary of astronomy, and to the privileges and feelings of a votary, is only to be gained by one means--sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in this or any other of the higher departments of science as can entitle him to form an independent opinion on any subject of discussion within their range." Concerning the value of mathematics as a means of mental discipline, and as an aid of unequalled power in every department of natural and experimental science, permit me to quote from the "Conflict of Studies", by Mr. Todhunter, one of the keenest and brightest scholars of Cambridge, England. He says:

"There is a wide difference between experimental science as taught by a pure experimentalist, and as taught by one who has himself gained the habits of exact thought and expression in a sterner school. A distinguished chemist, only recently lost to science, once expressed in my hearing his surprise at the uniform excellence of the papers in natural philosophy sent by the pupils of a certain college, contrasted with the inferior quality of the papers in another department of science. I did not suggest the explanation, though I had no doubt about it; the natural philosophy was taught by a man thoroughly trained in mathematics . . . . Nor do I know any study which can compete with mathematics in general in furnishing matter for severe and continued thought. Metaphysical problems may be even more difficult; but then they are far less definite, and as they rarely lead to any precise conclusion, we miss the power of checking our own operations, and of discovering whether we are thinking and reasoning, or merely fancying and dreaming."

However valuable the study of the languages, ancient or modern, may be, an immense amount of time must be consumed in their acquisition before they are available for uses which they must subserve. I would not detract one jot from their importance as factors in the great educational problem, for I place them in the front rank, and esteem them as highly as the most cultured linguist does; yet I affirm, that for immediate value and use, for freshness and reality, for satisfaction to the student of every degree of advancement, there is nothing comparable with the science of mathematics.

During the year that has just closed, your honorable body has seen fit to allow two terms of electives in mathematics. I hope the time is not far distant when this important and most exact of all the sciences will be carried to its utmost reach in the University of Kansas, that Quaternions, Trilinear Coordinates, the Method of Least Squares, Geometry of Three dimensions, the Theory of Probabilities, etc., may meet that proper encouragement which their transcendent importance merits.

Miller's 1880 report to the Board of Regents emphasizes his belief in the value of mathematics as a subject for study and also his ambition for the development of a strong Department of Mathematics in The University of

Kansas. Did the progress of the young university justify his ambitions? A summary of the situation in 1881-1882 indicates that it did. To be sure, the mathematics staff was small: it consisted of Professor Ephraim Miller and Assistant Professor F. O. Marvin. Also, the University had only two buildings, North College and Fraser Hall, and almost the entire University was housed in the latter. The faculty, however, already contained important scholars and foretold important developments in the future. The catalog for 1881-1882 lists the "Board of Instruction"--the faculty--as follows:

James Marvin, A.M., D.D.,
President, and Professor of Mental and Moral Philosophy.
Frank H. Snow, A.M., Ph.D.,
Professor of Natural History.
David H. Robinson, A.M.,
Professor of Latin Language and Literature.
Ephraim Miller, A.M.,
Professor of Mathematics.
George E. Patrick, M.S.,
Professor of Chemistry, Mineralogy and Metallurgy.
Frances Schlegel,
Professor of German and French Languages and Literature.
James H. Canfield, A.M.,
Professor of History and Political Science.
Kate Stephens, A.M.,
Professor of Greek Language and Literature.
James W. Green, A.M.,
Dean of Law Department.
Herbert S. S. Smith, C.E.,
Professor of Physics, Astronomy, Civil Engineering, and Free-hand Drawing.
P. J. Williams, A.M., D.D.,
Dean of Normal Department.
Leverett W. Spring, A.B.,
Professor of English Literature, Rhetoric, and Belles Lettres.
Frank O. Marvin, A.M.,
Assistant Professor of Mathematics, Physics, and Civil Engineering.
James W. Glee, A.B.,
Instructor in Elocution and Latin.
William H. Carruth, A.B.,
Instructor in German, French, and English.
Marcus Summerfield,
Assistant Professor in Law Department.
Richard A. Lehman,
Mary E. Grew,
Instructors in Music.

James Marvin was chancellor of the University and president of the faculty. Snow was already making a national and international reputation for himself in natural history, and he was destined to become one of the greatest of the University's chancellors [Hyder 1]. Robinson, one of the original faculty of three, would become the first dean of what is now the College of Liberal Arts and Sciences [Hyder 1, pp. 200, 255; Taft, pp. 44, 172]. Miller would be known as the builder of a significant Department of Mathematics, as the University's best-loved teacher, and as the successor to Robinson as dean [Miller 5, 8, 9; Hyder 1, pp. 173-174; Taft 1, p. 44]. Frances Schlegel is best remembered for her illustrious student and husband, William Herbert Carruth [Hyder 1, p. 174; Schlegel 1]. James H. Canfield, Professor of History and Political Science and one of the University's great teachers, later became President of the University of Nebraska, President of Ohio State University, and Librarian of Columbia University [Canfield 1-9]. Kate Stephens was widely known later as an alumna of of the University--the first alumna who held a position on the faculty--and as a literary figure [Hyder 1, pp. 138-140, 184-185]. James W. Green organized the Law School in 1878; he is immortalized by the statue of "Uncle Jimmy" which stands in front of Green Hall today [Hyder 1, pp. 259-260; Taft 1, pp. 30, 31, 44, 82, 116, 119, 174, 184]. Leverett W. Spring wrote a history of Kansas [Spring 1]; he later joined the faculty of Williams College, his alma mater [Hyder 1, pp. 185, 197]. Frank O. Marvin's fame is secure for his work in establishing and developing the School of Engineering [Marvin 1, 3]. James W. Gleed and William Herbert Carruth were two of Ephraim Miller's students at the Lawrence High School [Hyder 1, pp. 173-175]. Gleed taught Latin, English, and elocution (and also Greek during Kate Stephens' absence in Europe); later he was a lecturer in the School of Law, and became a distinguished Topeka lawyer and alumnus of the University [Hyder 1, pp. 115, 173-174; Carruth 4]. William H. Carruth married Frances Schlegel, his German teacher in the University, and became one of the most famous members of the faculty of The University of Kansas and later of Stanford University [Carruth 2, 4; Hyder 1, pp. 146, 173-175, 186, 199, 229, 246, 258; Schlegel 1; Taft 1, pp. 41, 44, 55-57, 110, 177-178]. As the author of "Each in His Own Tongue" and other poems, Carruth is the University's most distinguished poet. Finally, Carruth rivals Ephraim Miller as the University's best-loved teacher [Carruth 4]. With a faculty of such distinction, Miller's hopes and plans for the development of mathematics at The University of Kansas do not seem presumptuous.

In 1881-1882, however, the University still had a long way to go. The catalog shows an enrollment that year of 443 students.

| | |
|---|---|
| Department of Science, Literature and Arts | 151 |
| Normal Department | 53 |
| Department of Elementary Instruction | 237 |
| Law Department | 7 |
| Musical Department | 23 |
| Total in all Departments | 471 |
| Names counted twice | 28 |
| Total attendance | 443 |

It should be observed that more than half of all of those in attendance were enrolled in the Preparatory Department. The library contained only 5500 volumes and 1780 unbound pamphlets, but the situation was improving: the catalog promised that $1000 would be spent annually for the library during 1882 and 1883.

Although the physical facilities were modest--two buildings and only a small library--,plans were ambitious; for already a graduate program was being developed. For many years master's degrees had been essentially honorary degrees, and as late as 1895 Ephraim Miller received an honorary Ph.D. degree from Allegheny College. The statement of requirements in the 1880-1881 catalog shows that the master's degrees of The University of Kansas were only slightly more than honorary. The requirements were: "(1) that the candidate shall be a graduate of this or some other College or University empowered to confer degrees; (2) that he shall have been engaged for at least three years after graduation in Professional, Literary or Scientific studies; (3) that he present a satisfactory thesis to the Faculty on some Professional, Literary or Scientific subject." The 1881-1882 catalog, however, describes the beginning of a real graduate program and outlines substantial requirements for "post-graduate degrees" or "second degrees" (following B.A. and B.S. degrees):

> The Faculty will recommend to the Regents for second degrees, graduates of this University, or of other institutions of a similar grade, on the following conditions:
>
> I. Each candidate for a Post-graduate Degree shall devote two hours daily, five days in each week of the University year, for three years, to a course of study preparatory to such degree. In special cases candidates may be allowed to condense the above aggregate of work into two years.
>
> II. Examinations shall be required of the candidates at the end of each year.
>
> III. The Courses of study shall be of two kinds--special and general.
>
> IV. In each course an effort shall be made to secure, as far as practicable, original work.
>
> V. The special courses shall include the following topics:
>
> A. Metaphysics and Logic.
> B. Political and Social Science.
> C. History.
> D. English Language and Literature.
> E. German Language and Literature.

F. French Language and Literature.
G. Latin Language and Literature.
H. Greek Language and Literature.
I. Pure Mathematics and its application to Mechanics.
J. Pure Mathematics and its application to Astronomy.
K. Pure Mathematics and its application to Molecular Physics.
L. Pure Mathematics and its application to Engineering.
M. General and Analytical Chemistry.
N. Agricultural Chemistry.
O. Geology and Meteorology.
P. Botany and Entomology.
Q. General Zoology, Comparative Anatomy, Human Physiology.

VI. A general course may be selected from the special courses above enumerated. Such general courses shall consist of one year's work in each of three special courses, to be selected by the candidate, with the approval of the Faculty. By special permission, a general course may be made to include two year's work in one of the special courses and one year's work in a second special course.

In those early days Fraser Hall--inadequate though it must have been--provided a wonderful home for the University. The 1881-1882 catalog contains floor plans for the basement and three floors and describes the assignment of offices and classrooms. The chancellor's office and faculty room was on the first floor on the south side of the main entrance (on the east side of the building). The regent's room and office of the treasurer was on the north side of this same entrance. The library was located in a large room on the first floor at the southwest corner of the building. The first floor also contained four offices for professors and five large "lecture rooms" and "recitation rooms". One of these offices was the "study of Professor of Mathematics", with a connecting classroom described as the "mathematical room". This study was a small room on the east side of the building opposite the north stairway; the "mathematical room" was a large classroom at the northeast corner of the building. The other three offices on the first floor were assigned to the "Professor of History and Political Science", the "Professor of Astronomy", and the "Dean of Normal Department". In the basement and on the second and third floors there were offices for other faculty members, classrooms, and laboratories. The building itself must have promoted scholarship, learning, and a tremendous sense of comradeship and unity of purpose that cannot be achieved in the widely scattered activities of the modern campus.

The report which Ephraim Miller, as Professor of Mathematics, submitted to the Board of Regents in September 1882 gives an indication not only of his teaching schedule but of his teaching philosophy as well.

> The schedule in mathematics during the past two years was as follows, viz: (a.) The preparatory classes in arithmetic were assigned to [the] Normal Department. (b.) One section of the middle preparatory algebra, and one of the senior preparatory geometry, were taught by the assistant professor. (c.) Instruction in all of the collegiate mathematics was given by myself.
>
> The following exhibit will show the attendance of my own classes:

| Class | 1880-1881 | 1881-1882 |
|---|---|---|
| Freshman-Algebra | 56 | 79 |
| Geometry | 48 | 53 |
| Sophomore--Trigonometry | 33 | 44 |
| Anal. Geometry | 25 | 40 |
| Junior--Calculus | 4 | 2 |
| Middle Preparatory--Algebra | 81 | 115 |
| Senior Preparatory--Geometry | 58 | 48 |
| Total | 305 | 381 |

> Students have been encouraged to read their authors with the most sustained attention, in order to discover the meaning of every sentence. With a text fairly intelligible, and an abundance of illustrative examples, our textbooks will endure and repay the closest examination. In some instances, owing to the immaturity of the learner, and not knowing how to fix his mind upon the work before him, he has hurried over the text without any sincere and vigorous effort to understand it, and rushed to some example to clear up what

ought not to have been obscure, if it had been adequately considered. The habit of scrupulously investigating the text seems to me important on several grounds. The close scrutiny of language is a very valuable exercise, both for studious and practical life. In the higher mathematics the habit is indispensable. There the student must encounter and master, sentence by sentence, an extensive and complicated argument.

The great embarrassment to beginners is, not the obscurity of definite and isolated passages, but the inability to discover what is the general drift of the processes, and consequently too often a want of faith as to the existence of any distinct object to be attained. It is very difficult to find a remedy for this depression of mind, but many men, laboring under such difficulties, have gone on in their studies, found them permanently attractive, and used them for most important ends. My advice to students so situated always is: Go on, and rest assured that the nature of the apparently unmeaning preliminaries will ultimately be understood and appreciated. I have had the assurance frequently given me that this kind of advice has been followed by the most satisfactory results.

The question is now and then stated, whether the special advantages of mathematics are sufficiently great to warrant the expenditure of time and labor required to master them. To answer: I should like to draw attention to the inexhaustible variety of the problems and exercises which it furnishes. When a deduction to a beginner is proposed, he has, in many cases, before him an exercise that would have commanded the admiration of the old Greek geometers in their most vigorous days. The possibility of early employing the constructive and imaginative faculties is an important gain for students who become weary of the prolonged and unvaried exercise of mere receptive attention. Another great and special excellence of mathematics is, that it demands earnest, voluntary exertion.

Such, in brief, is the kind of work that I have been endeavoring to secure from students. In the great majority of cases it has succeeded admirably. Failures there were, as might be expected.

My conviction is, that all of my pupils have been made stronger mentally, better able to follow an argument to its logical conclusion, and more capable of reasoning intelligently and coherently, simply because of the rigidness with which they were held to their work.

Professor Miller's 1882 report to the regents shows that he had a heavy teaching load--heavy even with the help of Assistant Professor F. O. Marvin.

But his teaching load soon became heavier, because Miller was the only instructor in mathematics from the academic year 1882-1883 through 1885-1886. Miller was given an assistant, however. The *Journal of the Board of Regents* records that at a meeting held August 29, 1883, the regents voted that W. C. Spangler be appointed temporarily to the position of assistant in mathematics; the minutes show that the appointment was made on recommendation of Professor Miller. At a meeting held on September 26, 1883, the regents "voted that the matter of employing an assistant to Prof. Miller be referred to the Prof. and the Chancellor with power to act and that the compensation be fixed at 50¢ per hour--also that the same compensation be allowed W. C. Spangler for work already done in that direction". Nothing further is known about "an assistant to Prof. Miller", but the September action of the regents suggests that Spangler's service was strictly temporary, and that someone else was employed as Miller's permanent assistant.

W. C. Spangler played an important role in the life of the University. He was born on August 7, 1859 on a farm near Peotone, Illinois, but his family soon moved to Kansas. He entered The University of Kansas in the fall of 1879, but after his first year had exhausted his funds, Spangler sought a position as a school teacher for the next year. On November 15, 1880, however, he became Secretary of the University, a part-time position which enabled him to continue as a student. The catalog for 1881-1882 lists him among the "Officers of the Board" of Regents and describes his position as "Clerk and Book-keeper". He graduated with a B.S. degree in 1883; the catalog records that he held the "appointment" from the Scientific Department at commencement in 1883. He entered the Law School in the fall of 1883; it was at this time that he also served as an assistant to Professor Miller. Spangler continued as Secretary of the University from 1880 until he was graduated from the

Law School in 1885, at which time be began the practice of law in Lawrence. In 1889 he was appointed a regent of the University. Chancellor Lippincott's resignation became effective on September 1, 1889, and Spangler was appointed vice-chancellor and later acting chancellor [Hyder 1, pp. 186-187]. F. H. Snow was elected chancellor by the regents on April 11, 1890 and was inaugurated on June 11, 1890. Spangler again served as acting chancellor from the fall of 1900 until August 1902, when Frank Strong became chancellor [Hyder 1, p. 227; Taft 1, pp. 74, 152]. Spangler died on October 22, 1902, at his home in Lawrence; his death, caused by tuberculosis, was hastened by overwork as acting chancellor of the University. Four memorial addresses delivered in University Hall on December 5, 1902 contain a full account of William Cornelius Spangler and of his life and work [Spangler 1]. These addresses emphasize that in 1883 Ephraim Miller had chosen a temporary assistant of the highest caliber, although one who was not a specialist and a scholar.

Joshua Allen Lippincott, a professor of mathematics and astronomy in Dickinson College in Pennsylvania, was appointed chancellor of the University in 1883 [Ellsworth 1, part I; Hyder 1, p. 186; Lippincott 1; Strong 1; Taft 1, pp. 24, 35, 45, 88]. Thus, four of the first five chancellors--Fraser, Marvin, Lippincott, and Snow--had been professors of mathematics at one time, a fact which emphasizes the important position in the curriculum held by mathematics before the elective era. The most complete account of the life and work of Chancellor Lippincott is contained in an article in *The Graduate Magazine* written by Professor Charles G. Dunlap [Lippincott 1; S, ch. 1, sec. 3].

The catalogs for 1882-1883 (p. 78) and 1883-1884 (p. 76) announced that "a special prize of $25 is offered by W. W. Cockins for the best scholarship in Mathematics, in Freshman and Sophomore classes". Under "Prizes, 1883" in the 1883-1884 catalog (p. 33) we learn that Frank Howard Clark received the Cockins prize in sophomore mathematics, and that Olin Templin received the Cockins prize in freshman mathematics. Under "Prizes, 1884" in the catalog for 1884-1885 (p. 34) we find the following:

> "Cockins prize for Fresh. and Soph. Math --- W. S. Franklin."

The catalogs state that Mr. W. W. Cockins, the donor of the prize, was a citizen of Lawrence, but nothing further is known about him. Also, subsequent catalogs contain no additional announcements of the Cockins prize nor of its award. By contrast, a great deal is known about two of the three who received Cockins prizes, although little is known about the third. The Catalogue Number of *The Graduate Magazine*, which lists all graduates of the University up to 1913, contains the following entry about the obscure winner:

> 1883 Normal Department
> Clark, Frank Howard, B.D. (A.M. University of Colorado, 1901).
> 715 Ernest and Cranmer building, Denver, Colo.

Nothing further is known about Frank Howard Clark. Olin Templin, however, who received the Cockins prize in freshman mathematics in 1883, was destined to become one of the giants of the University: he graduated in 1886, became a graduate student and assistant in mathematics the same year, and in 1889 received the first master's degree awarded by the Department of Mathematics; he later established the Department of Philosophy; and in 1903 he succeeded Ephraim Miller as dean. Finally, he made many other contributions which will be described in this history.

William Suddards Franklin, who received the Cockins prize for freshman and sophomore mathematics in 1884, became a nationally famous physicist:

he received a "star" in *American Men of Science* [Franklin, W. S. 1, 2]. He was the brother of Edward Curtis Franklin, an equally famous chemist who was a member of the faculty of Stanford University for many years [Franklin, E. C. 1, 2]. W. S. Franklin began teaching physics to college classes in his second year in the University; he graduated in 1887 and was immediately appointed an assistant professor. In 1892 he left The University of Kansas permanently; during the remainder of his life he was professor of physics and electrical engineering at Iowa State College (1892-1897), Lehigh University (1897-1915), Massachusetts Institute of Technology (1915-1929), and Rollins College in Florida (1929-1930). He is best known as a teacher and as a writer, especially of textbooks. Professor E. L. Nichols, who taught physics to W. S. Franklin in the University, wrote as follows about him [Franklin, W. S. 1]:

> In mathematics his ability was no less surprising. Discussing a knotty point in Maxwell's great work on Electricity and Magnetism, which was not, by any means, a treatise which undergraduates were expected to master, he said, quite truthfully, "The mathematics does not trouble".

Vernon Kellogg, in a note added to Nichol's article [Franklin, W. S., 2], praised his mathematical abilities thus: "The story is told that he took in his freshman year all the courses in mathematics offered in the University in his day. Perhaps this is apochryphal but there is no doubt that he was a youthful mathematical prodigy." The Cockins prizes are the first distinctions in mathematics recorded in the history of the University. Two of the three students who received these prizes are counted among the most distinguished of the University's graduates.

The report which Ephraim Miller submitted to the Board of Regents in 1884 reveals his strengths as a teacher and his plans for the development of an outstanding department.

The number of students who have received instruction in mathematics during the two years just past, is as follows:

| | 1882-83 | 1883-84 |
|---|---|---|
| Preparatory--Algebra | 129 | 130 |
| Geometry | 100 | 103 |
| Freshman--Algebra | 75 | 100 |
| Geometry | 70 | 75 |
| Sophomore--Trigonometry | 46 | 59 |
| Analytical Geometry | 36 | 49 |
| Junior--Calculus | 9 | 8 |
| Totals | 465 | 524 |

The work being excessively severe, requires all the energy and skill that a teacher possesses to handle in any satisfactory manner such unwieldy classes. If numbers are a criterion of success, it must be admitted that the desired result has been reached; but to the thoughtful teacher comes home the truth that large classes in mathematics are the most difficult to instruct; that with the severest and most exhaustive efforts to reach every member of such classes, so that nothing may be left in mist and confusion, there will always be some who, if they see at all, see as through a glass, darkly; that to do the best work, to make difficulties clear to the mind of the most obtuse student, in other words, to *know* that every member is making progress, classes in mathematics should never exceed twenty-five in number; that it is the "personal equation", the power to take hold of the individual, to encourage, to excite interest, and when that is aroused to make it perpetuate itself in an increasing ratio, that must enter very largely into all teaching of mathematics in order to reach the best results. The Preparatory classes, and the Freshman also, would do better work, do it more easily and understandingly, and in less time, if they were divided into three sections each, with wide-awake, thoroughly competent and energetic teachers to direct them.

The advantages that would accrue from such an arrangement, especially in geometry, are that the inventional and imaginative power of the student, which Herbert Spencer insists so much upon, would be developed and enlarged; the reasoning faculties would be exercised in a more strictly philosophical order;

> and many who go on from week to week, blindly groping their way in the dark, only to be overwhelmed at last in utter confusion and disgusted at their ignominious failure, would, under the direct and powerful magnetism and enthusiasm of a go-ahead, live, pushing teacher, soon have their dormant faculties aroused, their perceptions made clearer, their wits sharpened, and a rush of new ideas changing the whole current of their thought-life.
>
> It gives me great pleasure however to state that, crowded as the classes were, no preceding years have been so full of real, genuine success. Better work, more uniform in quality, firmer grasp upon principles, more determined effort to master difficulties, more enlightened class spirit, consciousness of power gained, keeness of vision, and more prolonged and sustained thought upon propositions demanding an exercise of the inventional faculty, have characterized the great body of the young men and women whom I have had the high privilege of leading in the various branches of mathematical science since my last report. The same results manifested themselves in the classes assigned to an assistant teacher.
>
> As our courses of study contemplate a wide range of optional work, when it can conveniently be done, it is expected that the coming year will witness the organization of a class, the first in the history of the University, in quaternions, and perhaps another in differential equations.
>
> Finally, gentlemen, whatever of power, whatever of skill, whatever of ability and enthusiasm I may possess, it is my determination, as in the past, to project these into all my work so long as my connection with the University shall continue.

Several remarks may be made about Miller's 1884 report to the regents. First, the report suggests why Miller has a reputation as the finest and best-loved teacher the University has ever had. Second, the catalog for 1882-1883 states that the first year of the Preparatory Department "has been dropped", and it was probably for this reason that Miller makes no reference to the teaching of arithmetic. Finally, in his report, Miller refers to "an assistant teacher", but does not identify him; it is not known who this assistant was.

The University had opened a Normal Department on April 3, 1876 (see the catalog for 1875-1876); the legislature had established the Normal Department in an effort to increase the supply of teachers for the state's schools. The Normal Department did not become a permanent part of the University, however, for "by action of the Board of Règents at their annual meeting, April 1, 1885, the Normal Department was discontinued" (p. 17 of the 1884-1885 catalog). The Normal Department conferred the degree of B.D.--Bachelor of Didactics--on its graduates, and Olin Templin received this degree in 1884. (The Legislature of the State established also a chair of Pharmacy; the 1884-1885 catalog states, on page 55, that "by action of the Legislature of the State, at its last session, the Board of Regents was directed to establish a chair of Pharmacy in the University, without delay". This action was the beginning of the School of Pharmacy.)

When the University had first opened in 1866, it enrolled all of its students in the Preparatory Department since not one of them was prepared to begin college level work. The early hope of abolishing the Preparatory Department quickly was not to be realized, but the University continued its efforts to strengthen the high schools of the state. The following statement occurs on page 55 of the catalog for 1884-1885.

> Sub-Freshman Class
>
> The lack of suitable preparatory schools in the State, at the time of the organization of the University, led to the establishment of a Department of Elementary Instruction. This department maintained a three year's preparatory course until the close of the collegiate year 1882-3, when, in accordance with the action of the Board of Regents, the lowest of these three years was discontinued. At a meeting of the Board during the present year, (1884-5), it was resolved, that in view of the increasing number and efficiency of the High Schools of the State, a still further reduction in this work might be made, and the Faculty was directed to discontinue the second year of the preparatory course, except as to the languages.

Thus, the first year of work in the Preparatory Department was dropped at the end of the 1882-1883 academic year, and the second year was dropped at the end of the 1884-1885 academic year. The accompanying table shows that more than half of the students enrolled in the University--even as late as 1884-1885--were in the Preparatory Department; it is not surprising that the University wanted to abolish its high school department so that it could concentrate all of it efforts on its university program. The Preparatory Department,

Preparatory Department, Collegiate Department, and Total University Enrollments in the Years 1878-1879 through 1891-1892

| | Preparatory Dept. | | | Collegiate Dept. | | | Total Enrollment | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Men | Women | Total | Men | Women | Total | Men | Women | Total |
| 1878-79 | 143 | 114 | 257 | 85 | 58 | 143 | 228 | 172 | 400 |
| 1879-80 | 144 | 107 | 251 | 98 | 89 | 187 | 242 | 196 | 438 |
| 1880-81 | 166 | 111 | 277 | 110 | 79 | 189 | 276 | 190 | 466 |
| 1881-82 | 141 | 96 | 237 | 121 | 85 | 206 | 262 | 181 | 443 |
| 1882-83 | 208 | 142 | 350 | 131 | 101 | 232 | 339 | 243 | 582 |
| 1883-84 | 163 | 105 | 268 | 146 | 106 | 252 | 309 | 211 | 520 |
| 1884-85 | 144 | 117 | 261 | 133 | 77 | 210 | 277 | 194 | 471 |
| 1885-86 | 90 | 53 | 143 | 168 | 108 | 276 | 258 | 161 | 419 |
| 1886-87 | 99 | 47 | 146 | 217 | 126 | 343 | 316 | 173 | 489 |
| 1887-88 | 110 | 62 | 172 | 196 | 115 | 311 | 306 | 177 | 483 |
| 1888-89 | 146 | 61 | 207 | 186 | 111 | 298 | 332 | 172 | 505 |
| 1889-90 | 90 | 48 | 138 | 244 | 126 | 370 | 334 | 174 | 508 |
| 1890-91 | 27 | 11 | 38 | 289 | 147 | 436 | 316 | 158 | 474 |
| 1891-92 | - | - | - | 424 | 207 | 631 | 424 | 207 | 631 |

The Preparatory Department enrollments and the total University enrollments were taken directly from the catalogs. The Collegiate Department enrollments were computed by subtracting the former from the latter. The inconsistency in the totals for 1888-89 occurs in the original table.

however, survived for a full twenty-five years: the academic year 1891-1892 was the first in which no preparatory work was offered. The plans for the final abolition of the Preparatory Department had been made long in advance as outlined on page 86 of the 1888-1889 catalog.

Sub-Freshman Courses

> . . . In furtherance of the same object a resolution was passed by the Board in August, 1888, limiting the time within which all sub-Freshman courses in the University shall be abolished. Under this plan no classes beginning Latin will be formed at the opening of the Fall term of 1889. Beginning classes will, however, be formed in 1889 in French and (for the last time) in Greek and German. In the fall of 1890 the last class beginning French will be formed. At the opening of the Fall term in 1891 and thereafter, no student will be received into the University who is unprepared for the work of the Freshman class in at least one of the four general courses. The order in which the sub-Freshman courses will be discontinued will be more definitely stated on pp. 87-88.

The 1884-1885 catalog describes plans to provide additional equipment for mathematics and astronomy.

> Mathematical models, numbering nearly one hundred, for the purposes of geometrical instruction, will be purchased and ready for use the coming year. By this collection, much time will be saved in giving to the student an accurate idea of the forms of the surfaces and solids to be studied. The mental image obtained from a visible object is much more lasting and definite than that obtained from any description. Twenty of these models will show intersections, junctions, and the piercing of the various solids.

Thus began a collection of wood, plaster, and string models which still exists in the Department. The same catalog states that "the facilities for practical work in astronomy have been increased by the purchase of a new six-inch refracting telescope (by Alvan Clark & Sons)". Astronomy was listed in the catalog as if it were a separate department, but it was taught by Professor E. L. Nichols and Professor Lucien Ira Blake in connection with physics. Very soon, however, astronomy would be combined with mathematics, and Ephraim Miller's title would become Professor of Mathematics and Astronomy.

Graduate degrees were first awarded in 1876, and by the middle of the 1880's a real graduate program was developing. The first commencement was held in 1873, when three students received A.B. degrees in college subjects and one received a B.S. degree in engineering. As explained above (see the catalog for 1880-1881), the early requirements for a master's degree were simple; a bachelor's degree, engagement for three years in professional, literary, or scientific studies; and a suitable thesis. In the beginning the regulations were liberally interpreted: it seems that "studies" were usually professional, literary, or scientific activity, or employment, and there is no record that any theses were written. The "three years" seemed to be the most rigid of the requirements for the master's degree. In keeping with these requirements, The University of Kansas awarded A.M. degrees in 1876 to two of those--Mrs. Flora Richardson Colman and L. D. L. Tosh--who received A.B. degrees in 1873 [*The Graduate Magazine* 2]. No master's degrees were awarded in 1877, but the record indicates that one or more master's degrees have been awarded every year beginning with 1878. A number of these early master's degrees were awarded to some of the most famous graduates of the University: an A.M. to Kate Stephens in 1878; an A.M. to James Willis Gleed in 1882; an A.M. to William Herbert Carruth in 1883; an M.S. to Erasmus Haworth in 1884; and A.M. to L. L. Dyche in 1886 and an M.S. in 1888. There is no record of a thesis written by any of these famous graduates.

As explained above, the 1881-1882 catalog describes a new set of requirements for "Post-Graduate Degrees". These requirements emphasize a bachelor's degree (as a prerequisite), three years of course work, examinations, and original work, but they do not mention a thesis. The record indicates, however, that a thesis soon became a standard requirement. The catalog for 1882-1883 lists the names of four "post-graduate" students; this is the first catalog to list such students. The catalog for 1883-1884 lists nine post-graduate students, and the 1884-1885 catalog lists eighteen. The catalog for 1885-1886 lists fourteen graduate students, and one of them is identified as "Moore, Lulu, A.B.--Mathematics--Cincinnati, Ohio". Miss Moore is the first known graduate student in mathematics; unfortunately, nothing further is known about her. Page 12 of the catalog for 1886-1887 lists fourteen "Post-Graduates", including "Templin, Olin, B.S.". Templin's degrees, however, are uncertain, since page 8 of the same catalog lists "Olin Templin, A.B., Assistant in Mathematics", and page 112 of the 1887-88 catalog states that Olin Templin received a B.S. degree with the class of 1886. There is a change in the listing of post-graduates in the 1887-1888 catalog: they are identified as "Graduate Students, Candidates for the Master's Degree". One is listed as a "resident" graduate student: "Nickel, Henri, A.B. 1887, . . . Eng., Gr., Lat., Hist. Newton". In addition, thirteen "non-resident" graduate students are listed; the catalog explains that "non-resident" means that the students are not attending classes. The 1888-1889 catalog lists three resident graduate students (none in mathematics) and ten non-resident graduate students, one of whom was in mathematics and, together with his wife, is listed as follows:

Templin, Olin, B.D., 1886, ..... Math. Berlin, Germ.
Templin, Lena Van Voorhis, B.A., 1886, Germ. Berlin, Germ.

Observe the error: Olin Templin received the B.D. degree in 1884, and either an A.B. or a B.S. degree in 1886. The 1889-1890 catalog lists three resident "Candidates for the Master's Degree", one of whom is identified as "MacKinnon, Annie Louisa, B.S./1889, Eng., Math. Concordia". In addition, the names of eight "non-resident" candidates for the master's degree are given, but none is in mathematics. Finally, not one of the six resident graduate students "Not Candidates for the Master's Degree" was in mathematics. In summary, of the seventeen graduate students listed, only Annie Louisa MacKinnon was in mathematics.

During the period from 1866 to 1890, three students are known to have been graduate students in mathematics. The first, Lulu Moore, has been lost to history. The second, Olin Templin, achieved greatness as a member of the University's faculty and administration. The third, Annie Louisa MacKinnon, became a professor of mathematics. She was a member of a class in modern geometry taught by H. B. Newson during the year 1891-1892 [see p. 47 of his paper entitled "Unicursal Curves by Method of Inversion", *Kansas University Quarterly*, vol. I, no. 2, October, 1892, pp. 47-69]. Furthermore, Professor Annie Louise MacKinnon, Wells College, Aurora, New York, was elected to membership in the American Mathematical Society at a meeting held on February 27, 1897 [*Bulletin of the American Mathematical Society*, 2nd series, vol. 3 (1896-1897), p. 227].

Bessie E. Wilder compiled the *University of Kansas Graduate School Theses, 1888-1947* [Wilder 1]; her record shows the following degrees *with theses* awarded in 1888 and 1889:

<u>1888</u>

Nickel, H. (M.A. Hist.)

<u>1889</u>

Briggs, A. E. (M.A. Eng.)
Franklin, W. S. (M.S. Phys.)
McDonald, H. H. (M.A. Eng.)
McLaren, J. D. (M.S. Nat. Hist.)
Templin, L. A. V. (M.A. Germ. Lang.)
Templin, O. (M.S. Math.)
Williams, H. T. (M.A. Philos.)

According to the record in the Catalogue Number of *The Graduate Magazine* [*The Graduate Magazine* 2], five persons received master's degrees in 1888:

Dyche, Lewis Lindsay, M.S., A.B., B.S. 1884, A.M. 1886.
Nickel, Henri, A.M., A.B. 1887, B.D. 1887.
Oliver, Hannah, A.M., A.B. 1874.
Scott, Charles Fred., M.S., B.S. 1881.
Wilcox, Mina Marvin, A.M., A.B. 1881, B.D. 1883.

A comparison of the two lists for 1888 leads to the conclusion that L. L. Dyche, Hannah Oliver, Charles F. Scott, and Mina Marvin Wilcox did not write theses for their master's degrees. The Catalogue Number of *The Graduate Magazine* states that "Stocks, Fred Asa M.S., B.S. 1884" received an M.S. degree in 1889, but the absence of his name from the list of 1889 theses indicates that he did not write one. Thus, seven of the eight who received master's degrees in 1889 wrote theses, and a thesis appears to have been a standard requirement for a master's degree from that time on.

The evidence presented indicates that Olin Templin received the first master's degree in mathematics from The University of Kansas. Bessie E. Wilder stated that the title of his thesis was "A Method of Dealing with Continuous Fractions", but that the thesis had been lost by the time she compiled her record. (An error seems likely in the title "Continuous Fractions".) Templin's degrees are uncertain: the 1886-1887 catalog lists both A.B. and B.S. for his bachelor's degree in 1886; Bessie E. Wilder listed an M.S. degree for Templin in 1889; and the Catalogue Number of *The Graduate Magazine* lists an A.B. in 1886 and an A.M. in 1889. About all that can be said with certainty is that Olin Templin received a B.D. from the Normal Department in 1884, *some* bachelor's degree in 1886, and *some* master's degree in 1889.

The University made strenuous efforts during this period to increase the size of its library--and with some success. The 1884-1885 catalog reports 7100 volumes in the library, the 1886-1887 catalog reports 8035 volumes, and the 1889-1890 catalog reports 11,722. Ephraim Miller had become the University Librarian on January 1, 1875, and he continued in this position until April 1, 1887; he was succeeded by his assistant, Carrie M. Watson. In the summer of 1887, the library was moved from the large room at the southwest corner of the first floor of Fraser Hall to three rooms at the north end of the first floor. One of these rooms had formerly been Professor Miller's lecture room and another had been Professor Templin's room [Taft 1, p. 35]. (The history of the library will be given in more detail in chapter 6.)

The staff of the Department of Mathematics experienced its first permanent increase at the end of the period under review. Miller alone taught mathematics from 1876 to 1878, but he had the assistance of F. O. Marvin from 1878 to 1882. From 1882 to 1886 Miller was again the only faculty member in mathematics, but his reports to the Board of Regents indicate that he had an unnamed assistant during at least a part of this period. In 1886 Olin Templin received an A.B. or B.S. degree and was immediately appointed "Assistant in Mathematics". Templin held this position through the academic year 1889-1890. He was on leave during 1888-1889; the catalog states: "Absent this year in Europe. His classes are taught by Mary E. Miller, A.B." Olin Templin received a master's degree--reported both as A.M. and M.S.--in 1889 at the end of his year in Berlin, Germany. The record does not say what he studied in Germany, but he spent the summer of 1888 in Göttingen [Templin 3]. In 1890 he was appointed "Associate Professor of Philosophy", and as a result, he left the Department of Mathematics permanently. Templin became, in his new position, the founder of the University's Department of Philosophy. Olin Templin became one of the giants of The University of Kansas, but there is no evidence that his work in mathematics had any lasting significance for the Department.

Mary Elwood Miller, Templin's replacement during his 1888-1889 absence in Europe, was a daughter of Ephraim Miller; one is led to conjecture that she may have been one of Miller's unnamed assistants (Olin Templin may have been another; see [Templin 3]). The Catalogue Number of *The Graduate Magazine* [*The Graduate Magazine* 2] shows that she received an A.B. degree from the College in 1884. At the time the Catalogue Number was published in 1913 she was Mrs. Mary Miller Barnes, and her address was given as Glenwood Springs, Colorado. When Professor Miller died in 1930, Mrs. Mary Miller Barnes lived in Long Beach, California [Miller 10]. Articles written at the time of Miller's death indicate that he had at least two other daughters, Mrs. Olive Stanley and Mrs. Lizzie Miller Richards, and a son, Mr. Lloyd Miller.

Ephraim Miller's reports to the Board of Regents indicate his desire to offer additional advanced courses in mathematics; several developments in the mid-1880's helped him to achieve his ambition. His load of high school teaching was lightened because the first year of the Preparatory Department was abolished in 1883 and the second year in 1885. Also, Olin Templin became his full-time assistant in 1886. Finally, on April 1, 1887, Miller resigned from his position as University Librarian. The 1886-1887 catalog shows that Professor Miller took advantage of the improved situation to introduce the advanced courses in mathematics which he felt the University should have. And, for the first time, this catalog gives a complete list of the courses offered by the Department (pp. 55-56). This list shows that Professor Miller was actually teaching courses in modern higher algebra and determinants, quaternions, and method of least squares; and that courses on the calculus of variations, modern geometry and trilinear coordinates, calculus of probabilities, and the theory of functions and elliptic functions were at least in the catalog. The complete list of mathematics courses in the 1886-1887 catalog is the following (in this list "(a) means that the study runs for the first half-term, (b) for the last half-term").

Prescribed Studies

*Freshmen Year*

Algebra.-- Wells's University Algebra. Required of students in all courses. 1st term (a). Every day, at 10. Prof. Miller and Mr. Templin.

Geometry.-- Wentworth's Plane and Solid Geometry. Required of students in all courses. 1st term (b). Every day, at 10. Prof. Miller and Mr. Templin.

Trigonometry.--Wentworth's Plane and Spherical Trigonometry. Required of students in all courses. 2nd term. Every day, at 9. Prof. Miller and Mr. Templin.

*Sophomore Year*

Analytical Geometry.--Newcomb's Analytical Geometry. Required of students in the G.Sc. course, and as an alternative with Zoölogy of students in the L.Sc., Cl., and M.L. courses. 2nd term. Every day, at 10. Prof. Miller.

Optional Studies

1. Differential and Integral Calculus.--Taylor's Calculus. 1st term. Every day, at 11. Prof. Miller.

*2. Modern Higher Algebra and Determinants.--Muir's Determinants. 1st term. Every day, at 9. Prof. Miller.

*3. Quaternions.--Hardy's Quaternions. 2nd term. Every day, at 12. Prof. Miller.

*4. Method of Least Squares.--Merriman's Method of Least Squares. 2nd term. Every day, at 11. Prof. Miller.

*5. Calculus of Variations.--1st term. Every day. Prof. Miller [Not given in 1887-88.]

*6. Modern Geometry, and Trilinear Coördinates.--2nd term. Every day. Prof. Miller. [Not given in 1887-88.]

*7. Calculus of Probabilities.--1st term. Every day. Prof. Miller. [Not given in 1887-88.]

*8. Theory of Functions, and Elliptic Functions.--1st term. Every day. Prof. Miller. [Not given in 1887-88.]

*9. Mathematical Readings and Discussions.--2nd term. Every day. Prof. Miller. [Not given in in 1887-88.]

Major Course in Mathematics: Math. 1, 2, 3, 4, taken in this order in consecutive terms.

Minor Studies: Math. 5, 6, 7, 8, 9; Phil. 1, 3, 4; Engineering 8, 13; Astronomy 1, 2; Physics 1, 2; English 7, 8, 10, 11.

Similar lists of courses are given in all subsequent catalogs. The list of advanced mathematics courses varied somewhat from year to year, but the following list, taken from the catalog for 1889-1890 (Olin Templin's last year in the Department) indicates that a substantial program of courses was actually being offered (the 1888-1889 and 1889-1890 lists of courses are identical).

Prescribed Studies

*Freshman Year*

Geometry.--Wentworth's Plane and Solid Geometry. Required of students in all courses. 1st term (a). Every day, at 10. Prof. Miller and Mr. Templin.

Algebra.--Well's University Algebra. Required of students in all courses. 1st term (b). Every day, at 10. Prof.

Miller and Mr. Templin.
Trigonometry.--Wentworth's Plane and Spherical Trigonometry. Required of students in all courses. 2nd term. Every day, at 9. Prof. Miller and Mr. Templin.

*Sophomore Year*

Analytical Geometry.--Newcomb's Analytical Geometry. Required of students in the G.Sc. course, and, as an alternative with Zoölogy, of students in the L.Sc., Cl., and M.L. courses. 2nd term. Every day, at 10. Prof. Miller.
Analytical Geometry.--Required of all students in C.E. and E.E. courses. 1st term. Every day, at 9. Prof. Miller.
Calculus.--Required of all students in C.E. and E.E. courses. 2nd term. Every day, at 10. Mr. Templin.

Optional Studies

1. Differential and Integral Calculus.--Taylor's Calculus. 1st term. Every day, at 11. Prof. Miller.
*2. Geometry of Three Dimensions and Advanced Integral Calculus.--Newcomb's Analytical Geometry of three dimensions, and Bowser's Integral Calulus. 2nd term. Every day, at 12. Prof. Miller
*3. Modern Higher Algebra and Determinants.--Muir's Determinants. 1st term. Every day, at 9. Prof. Miller.
*4. Quaternions.--Hardy's Quaternions. 2nd term. Every day, at 11. Mr. Templin.
*5. Method of Least Squares.--Merriman's Method of Least Squares. 2nd term. Every day, at 11. Prof. Miller.
6. Calculus of Variations.--1st term. Every day, at 11. Mr. Templin.
Major Course in Mathematics: Math 1, 2, 3, 4, taken in this order in consecutive terms.

In March 1889, Chancellor Lippincott submitted his resignation with a request that it become effective on September 1, 1889. After Lippincott resigned, the Board of Regents appointed W. C. Spangler vice-chancellor and later acting chancellor. The regents had difficulty in choosing Lippincott's successor, but finally on April 11, 1890, Francis Huntington Snow was elected the next chancellor [Hyder 1, pp. 186-190]. He had been Professor of Mathematics and Natural Sciences in the original faculty of three in 1866-1867. Professor Snow's appointment as chancellor brings to a close the pioneer period of the University.

The record of the Department of Mathematics for the pioneer period is brief but distinguished. The Department had given a large amount of instruction in both high school and college mathematics courses. The Department had developed a curriculum which included not only the standard courses but also advanced and modern courses--quaternions were discovered by Sir William Rowan Hamilton in 1843. The Department had had at least three graduate students, and it had conferred a master's degree--based on a thesis--on one of them, Olin Templin. The mathematics faculty had grown to two full-time members--a professor and an assistant--with the appointment of Templin in 1886. Although he had some assistance, Ephraim Miller must be given the credit for the inspiration and leadership that led to these achievements during the pioneer period.

Mathematics Staff, 1866-1890

| | |
|---|---|
| Francis Huntington Snow | 1866-1869 |
| Frederick W. Bardwell | 1869-1875 |
| Ephraim Miller | 1874-1910 |
| Frank Olin Marvin | 1875-1876, 1878-1882 |
| Olin Templin | 1886-1889 |
| Mary Elwood Miller | 1888-1889 |

## Chapter 2

## An Era of Greatness

## 1890-1910

The University had made rapid progress during the late 1880's, especially as a result of the phasing out of the Preparatory Department and the strengthening of the faculty through new appointments. The year 1890 brought several developments which foreshadowed important events to come. The first was the appointment of Henry Byron Newson as "Assistant in Mathematics" beginning with the year 1890-1891; Newson's appointment signalled the beginning of research in the Department. The second development was the establishment of chapters of Phi Beta Kappa and Sigma Xi in the University in April 1890. The third was the election--also in April 1890--of Francis Huntington Snow as the fifth chancellor of the University. Since these important events mark the opening of a new era for the University, they will be described in full detail.

Let us begin with the establishment of the chapters of Phi Beta Kappa and Sigma Xi. The facts are quite easily told, but it is important to learn the explanation for, and the significance of, these events. The Phi Beta Kappa Society was organized at the College of William and Mary, Williamsburg, Virginia, on December 5, 1776. By 1890 there were nearly thirty chapters, but they were all in the East--not a single one was west of the Mississippi River. The Society of Sigma Xi was organized in 1886 at Cornell University, and by 1890 there were three chapters--at Cornell, Union College (Schenectady), and Rennselaer Polytechnic Institute, all located in the State of New York. How did it happen that Kansas--a small, struggling, isolated university in the West--was honored by the establishment of chapters of these prestigious honor societies? The answer lies in the close and friendly relations that existed between The University of Kansas and the great colleges and universities of the East--Kansas was not as isolated as it appeared--and in the stature of the University's faculty.

On April 2, 1890, the Kansas Alpha Chapter of Phi Beta Kappa was organized with eight charter members [Phi Beta Kappa 1, 2, 3; Hyder 1, p. 184; Stouffer 1; Taft 1, p. 45]. Professor E. F. Engel, in an article about Phi Beta Kappa at the University, wrote: "Kansas Alpha Chapter was the 31st to be granted a charter by the National Society and was the first one established west of the Mississippi" [Engel 1]. A history of the chapter published in 1903 [Phi Beta Kappa 3] contains the following statements.

> The charter for Kansas Alpha chapter was granted by the Senate in 1889 on petition of the members of Phi Beta Kappa resident as members of the Faculty. Kansas Alpha chapter was organized April 2, 1890 and was the twenty-ninth chapter in order of organization. At the first meeting William Herbert Carruth and James Willis Gleed were elected from the Alumni, and five members from the Senior class of 1890.

F. H. Snow was elected the first president of the Kansas chapter. But the most important part of this history concerns the eight charter members: all eight had previously been elected to membership in Phi Beta Kappa by eastern colleges and universities. These eight charter members are listed below. Their degrees and titles are taken from the Supplemental Catalogue for 1889-1890 except in the case of Marsh and Winkler. The information about Marsh comes from the 1888-1889 catalog since he left Kansas to join the Harvard faculty in 1889 [Hyder 1, p. 186]; the information about Winkler is taken from the regular catalog for 1889-1890 since his name does not appear in the Supplemental Catalogue.

Charter Members of Phi Beta Kappa

Francis Huntington Snow, Ph.D., (Williams); LL.D., (Princeton); President.
Professor of Botany, Entomology, and Meteorology, and Director of the Museum of Natural History.
Elected to Phi Beta Kappa in 1862 at Williams College.

James Hulme Canfield, A.M., (Williams).
Professor of American History and Civics, and Corresponding Secretary of the Faculty.
Elected to Phi Beta Kappa in 1868 at Williams College.

Lucien Ira Blake, Ph.D., (Berlin).
Professor of Physics and Astronomy.
Elected to Phi Beta Kappa in 1876 at Amherst College.

Alexander Martin Wilcox, Ph.D., (Yale).
Professor of Greek Language and Literature.
Elected to Phi Beta Kappa in 1877 at Yale University.

Arthur Graves Canfield, A.M., (Williams).
Professor of French Language and Literature.
Elected to Phi Beta Kappa in 1878 at Williams College.

Arthur Richmond Marsh, A.B., (Harvard).
Professor of English Literature, Rhetoric, and Belles Lettres.
Elected to Phi Beta Kappa in 1883 at Harvard University.

David Hamilton Robinson, Ph.D., (Rochester).
Professor of Latin Language and Literature, and Secretary of the Faculty.
Elected to Phi Beta Kappa in 1887 at the University of Rochester.

Max Winkler, A.B., (Harvard).
Assistant in German and French.
Elected to Phi Beta Kappa in 1889 at Harvard University.

Clearly the University faculty was a distinguished one; it had been educated at--and given highest honors by--the best colleges and universities in New England. Furthermore, The University of Kansas was not isolated from the centers of learning.

The story of the establishment of Sigma Xi at the University is similar to that of Phi Beta Kappa. In a history of the chapter prepared on the occasion of the fiftieth anniversary of its founding we read the following [Sigma Xi 3].

> The Kansas Chapter, formerly known as the Iota Chapter, of the Society of the Sigma Xi was founded at the University of Kansas on April 21, 1890, with Professors E. H. S. Bailey, L. L. Dyche, F. H. Snow, F. O. Marvin, E. Miller, and L. I. Blake, heads of the scientific departments, as charter members. The charter to establish a chapter at the university was voted on December 4, 1889. At that time only three chapters were in existence, namely Cornell, Union and Rensselaer Polytechnic. The Kansas Chapter, therefore, has the distinction of being the fourth one to have been organized, and the first one to have been established in any state university, as well as the first one to have been located west of the Mississippi River. Since its founding the Kansas Chapter has been active continually over a period of fifty years and has grown in membership from 6 to over 900.

The charter members of Sigma Xi are listed in the Supplemental Catalogue for 1889-1890; they were the six full professors in the science departments of the University.

Charter Members of Sigma Xi

Francis Huntington Snow, Ph.D., (Williams); LL.D., (Princeton); President.
Professor of Botany, Entomology, and Meteorology, and Director of the Museum of Natural History.

Ephraim Miller, A.M., (Allegheny).
Professor of Mathematics.

Frank Olin Marvin, A.M., (Allegheny).
Professor of Civil Engineering.

Edgar Henry Summerfield Bailey, Ph.D., (Illinois Wesleyan).
Professor of Chemistry, Mineralogy, and Metallurgy.

Lucien Ira Blake, Ph.D., (Berlin).
Professor of Physics and Astronomy.

Lewis Lindsay Dyche, A.M., M.S., (Kansas University).
Professor of Zoölogy, Anatomy, and Physiology; Taxidermist, and Curator of Mammals and Birds.

But who or what supplied the connection between the University and the three chapters of Sigma Xi in New York State? A distinguished faculty member, as might be expected! Professor W. C. Stevens, in his "Reminiscences" in the fiftieth anniversary history of the Kansas chapter of Sigma Xi [Sigma Xi 3], wrote:

> This was the situation when the K. U. Chapter of Sigma Xi was founded. E. L. Nichols, after his graduation from Cornell, and research at Berlin, Göttingen and Johns Hopkins, had come to us in charge of Physics and Astronomy, and gone back to his Alma Mater to the headship of its Physics department, from which vantage point he was influential in the setting up of Sigma Xi at K. U. For this reason his name would occur in the memories of the beginnings of this chapter. I had three courses under Nichols and in harking back I ask myself the question how came it that he made so profound an impression on his students? I can see him now--tall, slender, awkward in movement and apparatus manipulation, serious, but with a friendly though fleeting and scarcely discernable smile; quiet in speech and absolutely without effort for dramatic effects. The atmosphere of his lecture room and laboratory was conducive to serious undistracted thinking. In his laboratory, believe me, you were on your own. He oriented you well at the outset, jotted down the necessary references and then for you it was sink or swim.

The establishment of the Kansas chapter of Sigma Xi emphasizes once more the distinguished members of the University faculty and the close connections, through these faculty members, with the leading colleges and universities in New England. Professor F. O. Marvin was elected the first president of the K. U. Chapter of Sigma Xi and Professor F. H. Snow was elected vice-president. Some years later, Dean Stouffer suggested that Snow probably would have been elected president had he not already been elected president of Phi Beta Kappa on April 2, 1890 and Chancellor of the University on April 11, 1890!

Chancellor Lippincott's resignation had become effective on September 1, 1889, but the regents were slow in naming a successor. W. C. Spangler was acting chancellor. At a meeting on March 12, 1890, the regents elected the Rev. Mr. Charles F. Thwing of Minneapolis, but he declined the offer. A. R. Marsh was proposed but was rejected. James H. Canfield was considered for the position, but there was strong opposition because of his free-trade views. Canfield suggested that the chancellorship should be offered to Snow [Hyder 1, pp. 187-190]. The election of Snow as the first president of the K. U. Chapter of Phi Beta Kappa and the first vice-president of the Chapter of Sigma Xi is proof of the high regard in which he was held by the entire faculty, and it is not surprising that "the Regents' minutes for April 11, 1890, record that 'on motion of Regent Gleed, Francis Huntington Snow was unanimously elected Chancellor of the University'" [Hyder 1, pp. 188-189; Stouffer gives the date as April 9, 1890].

The University was now entering on one of the most illustrious periods in its history. Dean E. B. Stouffer--mathematician, Dean of the Graduate School, and distinguished member of the University in a later era--gave a stirring account of the early period in an address delivered at the banquet celebrating the fiftieth anniversary of the establishment of the chapters of Phi Beta Kappa and Sigma Xi at the University. Because his address portrays Dean Stouffer--one of the important men in the history of mathematics at K. U.--as well as an early period in the history of the University, the published version of his address is reprinted in full in the Supplemental Volume [Stouffer 1; S, ch. 2, sec. 1].

The auspicious year 1890 brought--in addition to the establishment of chapters of Phi Beta Kappa and of Sigma Xi and the election of Francis Huntington

Snow as chancellor--the appointment of Henry Byron Newson, the University's first research mathematician, to a position on the faculty. The best accounts of the life and work of Newson have been given by his daughter Caroline (Mrs. Hugh M. Beshers) in three letters [S, Appendix III], by Professor Charles Graham Dunlap [Newson, H. B. 6], and by Dean Frank O. Marvin [Newson 7]; and biographical information is available in the standard references [Newson, H. B. 1, 8, 11, 12]. Professor Dunlap had joined the faculty in 1887 as "Assistant in English", and by 1890--following the departure of A. R. Marsh in 1889 to join the Harvard faculty--had been promoted to Professor of English Language and Literature. Professor Dunlap had been a fellow student with Newson as an undergraduate at Ohio Wesleyan University and as a graduate student at Johns Hopkins University, and his personal acquaintance with Newson probably led to the latter's appointment at The University of Kansas.

Henry Byron Newson was born near Mount Gilead, Morrow County, Ohio on July 10, 1860. He graduated from high school in 1879, and, after spending a year at home on the farm, he entered Ohio Wesleyan University in Delaware, Ohio in 1880. Scientific subjects and mathematics were his favorite studies; for a time he was especially interested in chemistry. An omnivorous reader with a retentive memory, he gained a wide and accurate knowledge of English literature. He maintained his interest in English literature throughout his life and was especially devoted to poetry, which he read widely and knew in depth. He graduated from Ohio Wesleyan University in 1883 and entered Johns Hopkins University in the fall of the same year. Although his major interest at the time was physics, he continued his study of mathematics. Unable to return to Johns Hopkins for a second year, he spent the next two years (1884-1886) as an instructor in mathematics and the sciences at Central Tennessee

College. In the fall of 1886, "the dream of his life was realized": he went to Germany to study for two years. Newson spent the first year (1886-1887) in Heidelberg, and the second (1887-1888) in Leipzig studying under Sophus Lie. By this time mathematics had become his dominant interest; it remained so for the remainder of his life. Newson developed his interest in the theory of groups of collineations--the subject of most of his later mathematical work--from Lie's lectures during 1887-1888. Newson returned to the United States in 1888 and during the two years 1888-1890 he was an instructor in mathematics and the sciences at Western Normal College, Bushnell, Illinois. In the fall of 1890 he came to The University of Kansas, where he remained until his death, twenty years later.

Professor Dunlap tells us that Professor Newson was a very reserved man, that he was essentially a thinker, and that he was given to brooding on questions that interested him. He was elected a member of Phi Beta Kappa at Ohio Wesleyan University and a member of Sigma Xi at The University of Kansas. He was persistent and tenacious--he never gave up. Strangers might think him taciturn, but those who knew him well found him delightful. These aspects of his character and personality are suggested by the excellent photograph of Professor Newson which accompanies Professor Dunlap's article [Newson, H. B. 6] and which was reproduced in the book [Newson, H. B. 11] which constituted Newson's life work.

Dean F. O. Marvin has written about Newson's work as a teacher and a scholar [Newson, H. B. 7, pp. 242-243]:

> As a teacher, he was more than a drill-master without neglecting in any way the necessity of being such, so long as drill was needed. He was stimulating and enthusiastic

> and aimed to train his students into self-reliance and freedom. While he appreciated the meaning of the work of the long line of mathematical thinkers throughout the past years, who applied their logic to the evolution of systems of study, he was ever on the alert for better methods of presenting the essentials of his specialty and adapting it to the needs of today. So he was interested and had a part in the modernizing movement that is changing the point of view with regard to mathematical writing from the abstract to the concrete. It was this spirit of adaptation that through his personality made him so influential and successful as a teacher of engineering students. His standards of scholarship were high, but his work was not all drudgery; the things he taught were alive with interest.
>
> For the advanced student of mathematics he still preserved this ability of stimulating interest, a quality often lacking in successful teachers of lower grade students. Here again the incentive used was essentially the same as with technical students--the gaining of such mathematical freedom that what had been learned should be only the tool with which to fashion yet more beautiful things. There was this difference however: the mathematical student was continually led toward individuality and trained for research.
>
> But however valuable a teacher's work may become, Professor Newson could not be content to allow his activities to rest there. He had an irresistible impulse to know something of the unknown; to become a discoverer of mathematical territory not found before. His efforts in this direction have been constant since his first coming among us, in so far as he could find time from his duties as a teacher. He made sacrifices of many things that other men would count too dear.

A pamphlet entitled "Graphic Algebra" which Professor Newson wrote appears to have been part of "the modernizing movement that is changing the point of view with regard to mathematical writing from the abstract to the concrete". This pamphlet was intended for use in secondary schools, and it received favorable reviews.

The *University News-Bulletin* of October 1, 1901 contains an announcement of Newson's election to membership in two of the most important foreign mathematical societies: the Circolo Matematico di Palermo, an Italian mathematical society, and the Deutsche Mathematiker Vereinigung, the national mathematical society of Germany. The announcement reads, "His election was based upon his contributions to mathematical science, most of which have been published in the *Kansas University Quarterly*. It is a distinct honor, as not more than a dozen Americans are members of these organizations." Professor Newson's memberships in the Deutsche Mathematiker Vereinigung and Circolo Mathematico di Palermo confirm that he was known internationally as a mathematician. The "star" which he received in his *American Men of Science*, First Edition (1906), biography [Newson, H. B. 1; S, Appendix IX, Newson, H. B.] proves that he held a high rank among the mathematicians in the United States. The First Edition of *American Men of Science* contains the names of more than four thousand men of science. The preface explains the significance of the "star":

> A star is prefixed to the subject of research in the case of about a thousand of the biographical notes. These are the thousand students of the natural and exact sciences in the United States whose work is supposed to be the most important. . . . The thousand are distributed among the sciences as follows:

| | | | |
|---|---|---|---|
| Chemistry | 175 | Pathology | 60 |
| Physics | 150 | Astronomy | 50 |
| Zoology | 150 | Psychology | 50 |
| Botany | 100 | Physiology | 40 |
| Geology | 100 | Anatomy | 25 |
| Mathematics | 80 | Anthropology | 20 |

> The star means that the subject of the biographical sketch is probably among the leading thousand students of science of the United States; but its absence does not necessarily mean that the subject of the sketch does not belong in this group, as the name may not have been considered in making the arrangements.

Additional scientists received "stars" in later editions of *American Men of Science*, and the Fifth Edition (1933) gave the complete rankings of the original thousand who received "stars" in the First Edition (1906). More precisely, the appendix to the Fifth Edition (1933) contains the names of the 250 scientists chosen to receive "stars" in the Fifth Edition of *American Men of Science* and the names and ranks of the "Leading Men of Science in the United States in 1903 Arranged in the Order of Distinction in Each Science". The second list begins with the names and ranks of the 80 leading mathematicians in 1903:

| Rank | Name | Birth and Death Dates |
|---|---|---|
| 1. | Eliakim Hastings Moore | 1862 - 1932 |
| 2. | George William Hill | 1838 - 1914 |
| 3. | William Fogg Osgood | 1864 - 1943 |
| 4. | Maxime Bocher | 1867 - 1918 |
| 5. | Oskar Bolza | 1857 - 1942 |
| . . . | | |
| 37. | Henry Byron Newson | 1860 - 1910 |
| . . . | | |
| 59. | Arnold Emch | 1871 - 1959 |
| . . . | | |
| 80. | James Maclay | 1864 - 1919 |

The ranks achieved by Henry Byron Newson and Arnold Emch (Newson's student and the first student to receive a Ph.D. degree in any field from The University of Kansas) were truly remarkable accomplishments.

Professor Newson and Miss Mary Frances Winston were married on July 21, 1900 [Newson, H. B. 12]. Mrs. Newson was also a mathematician, and her *American Men of Science* biography [Newson, M. F. W. 1, 1906; S, Appendix IX, Newson, M. F. W.] suggests that her education was even better than her husband's. Although Mrs. Newson was born in Forreston, Illinois, her family later lived at 1620 Massachusetts Street in Lawrence, Kansas [S, Appendix III]. She received her A.B. degree from the University of Wisconsin in 1889; from 1889 to 1891 she was an instructor in mathematics at Fox Lake, Wisconsin. There followed three years of graduate study, the first (1891-1892) at Bryn Mawr College, and the second and third (1892-1894) at the University of Chicago. An International Mathematical Congress was held in connection with the World's Columbian Exposition in Chicago, August 21-26, 1893; Felix Klein from the University of Göttingen attended the Congress as an Imperial Commissioner at Kaiser Wilhelm's personal request. After the Congress, Klein gave a series of colloquium lectures from August 28 to September 9 at Northwestern University, and Mary Frances Winston (fellow at the University of Chicago) was one of the twenty-three persons who attended these lectures [Archibald 1, p. 66; S, Appendix III]. Klein encouraged her dream of studying abroad. "If she came and Göttingen refused her he thought she could get in at Zürich." Mary Frances Winston and Grace Chisholm Young (from England, wife of W. H. Young) entered Göttingen at the same time. Miss Winston received her Ph.D. from Göttingen in 1896, and thus became the first American woman to receive the Ph.D. degree in mathematics at a German university [S, Appendix III; Newson, M. F. W. 3, p. 747]. Further details are given in [Newson, M. F. W. 4, 5].

Mary F. Winston taught in the St. Joseph (Missouri) High School during 1896-1897; on January 30, 1897, she was elected to membership in the American Mathematical Society [Newson, M. F. W. 2, p. 199]. From 1897 to 1900 she was Professor of Mathematics at Kansas State University in Manhattan.

Professor and Mrs. Newson made their home at 1702 Massachusetts Street, in the next block from the home of the Winston family at 1620 Massachusetts Street. Professor Newson's sudden death from a heart attack on February 17, 1910, was a great tragedy for The University of Kansas as well as for his young family. Their difficulties are described in the letters in Appendix III of the Supplemental Volume; the problems that resulted for the Department of Mathematics are described later in this chapter and the next. To support her family, Mrs. Newson served as Assistant Professor of Mathematics at Washburn University in Topeka, Kansas from 1913 to 1921, and as Professor of Mathematics at Eureka College in Eureka, Illinois from 1921 to 1942.

The 1937 summer meetings of the American Mathematical Society and the Mathematical Association of America were held September 6-10 at the Pennsylvania State College. On September 8 a special luncheon for women, sponsored by the local chapter of Sigma Delta Epsilon, was held in honor of the women who were pioneers in mathematical research in America. One of the three women honored was Professor Mary Winston Newson [Newson, M. F. W. 3, p. 747]. "In about 1941 she was chosen by Carrie Chapman Catt to be honored as one of 100 women to succeed in positions once open only to men" [S, Appendix III]. Clearly, Mrs. Newson was an unusual woman, but then her husband was also unusual. Mrs. Beshers, their daughter, has written, "I think in that day (if not in this) it was an unusual man who married a woman with many years more schooling than himself, especially in the same field" [S, Appendix III]. Professor Mary W. Winston died in 1959 [S, Appendix III; *American Men of Science*, 1961].

Under the stimulating leadership of Chancellor Snow, the University experienced a succession of important developments in its organization and activities. The School of Engineering was organized in 1891, and Frank O. Marvin was appointed its first dean [Hyder 1, p. 255; Taft 1, p. 34]. Also in 1891, Snow organized the School of Arts; before 1891 the subjects in this School had formed merely a department of the University [Taft 1, pp. 78-79]. In the year 1892-1893 Snow appointed David H. Robinson, a member of the faculty since 1866 and its secretary for many years, to be the first Dean of the School of Arts [Hyder 1, p. 200]. Later, in 1904, the name of the School of Arts was changed to the College of Liberal Arts and Sciences by the Board of Regents [Taft 1, pp. 78-79].

In 1891 the title of Ephraim Miller's professorship was changed. At a meeting held on April 3, 1891, the Board of Regents "voted that the Chair of Mathematics be abolished and that the Chair of Mathematics and Astronomy be created in its stead, and that Prof. E. Miller be appointed to this new Chair". Remembering the numerous fields of science specified in the all-encompassing titles of such universal geniuses as Snow and Dyche, we surmise that Ephraim Miller may have felt lonely with mathematics as the sole domain of learning assigned to him; but more likely, the addition of astronomy in his title merely recognized Miller's growing interest in the subject and the assignment of responsibility for astronomy to the Department of Mathematics. In any case, the catalog for 1890-1891 shows that Miller was teaching courses in descriptive astronomy and practical astronomy (in 1889-1890 astronomy was taught by W. S. Franklin), and the catalog for 1892-1893 lists a single Department of Mathematics and Astronomy. The University catalogs indicate that astronomy had not been officially associated with mathematics since F. W. Bardwell held the title "Professor of Mathematics and Astronomy" in 1874-1875.

H. B. Newson's arrival in 1890 led to a quickening of activity in mathematics; the first evidence is the list of new courses, taught by Newson, that appeared in the catalog as early as 1890-1891. As expected, Newson added courses in geometry. The complete list of courses in mathematics in the catalog for 1891-1892 follows:

Prescribed Studies

*Freshmen Year*

Geometry.--Wentworth's Plane and Solid Geometry. Required of students in all courses. 1st term (a). Every day, at 9 or 10. Professor Miller and Mr. Newson.

Algebra.--Wells' College Algebra. Required of students in all courses. 1st term (b). Every day, at 9 or 10. Professor Miller and Mr. Newson.

Trigonometry.--Miller's Plane and Spherical Trigonometry. Required of students in all courses. 2nd term, first three-fifths. Every day, at 9 and 10. Professor Miller and Mr. Newson.

*Sophomore Year*

Analytical Geometry.--Smith. Required of all students in C.E., E.E., G.Sc., and L.E. Courses. 1st term. Every day, at 9. Mr. Newson.

Calculus.--Required of all students in G.Sc., C.E. and E.E. Courses. 2nd term. Every day, at 10. Professor Miller.

Optional Studies

1. Analytical Geometry.--Smith. 1st term, at 9. Mr. Newson.

2. Differential and Integral Calculus.--Taylor. 2nd term. Every day, at 10. Professor Miller.

*3. Modern Higher Algebra and Determinants.--Salmon and Muir. 1st term. Every day, at 11. Professor Miller.

*4. Modern Analytic and Synthetic Geometry of Two Dimensions.--1st term. Every day, at 11. Mr. Newson.

*5. Modern Analytic and Synthetic Geometry of Three Dimensions.--2nd term. Every day, at 11. Mr. Newson.

*6. Theory of Functions and Elliptic Functions.--1st term. Every day, at 9. Professor Miller.

*7. Differential Equations and their Applications to Geometry and Physics.--2nd term. Every day, at 12. Mr. Newson.

Major Course in Mathematics: 1, 2, 3, 4, 5 and 6 taken consecutively, and in the order named.

Astronomy

1. Descriptive Astronomy.--Lectures and recitations, with occasional evenings for observation. Young's Astronomy. 1st term. Every day, at 2. Professor Miller.

2. Practical Astronomy, including the Theory of Least Squares.--Use of sextant and transit instrument, determinations of time, latitude and longitude, etc. Doolittle's Practical Astronomy. 2nd term. Every day, at 11. Professor Miller.

Astronomy 2 is especially adapted to the needs of students in Engineering.

N. B.--Astronomy 2 must be preceded by Astronomy 1.

No major course is offered in Astronomy at present.

(The star which is prefixed to optional course numbers in mathematics is not explained in the 1891-1892 catalog. Earlier catalogs, however, indicate that this star means that before a student may enroll in the course, he must have completed the stated prerequisites for the course and, in addition, have the permission of the instructor.) Although enrollments in the University continued to grow, the introduction of the elective system lightened the load on the Department of Mathematics [Taft 1, pp. 78-79]. As early as 1880, juniors and seniors in the general scientific and modern language courses were permitted, on petition to the faculty, to choose two optional courses each semester from a limited group of electives. In 1885 the requirement concerning analytic geometry was changed to read "Analytical Geometry; or Zoology, and Laboratory Practice". In 1887 the work of the junior and senior years was made more flexible; in 1895 a further broadening of the elective system permitted junior and senior students "to take anything they chose from the offerings of twenty departments, provided that a student did not take more than four courses under one instructor. The final step in the elective age was reached in 1903 when the only courses specifically required for graduation were rhetoric, hygiene, and physical education" [Taft 1, pp. 78-79].

The decreasing requirements that resulted from the introduction of the elective system counter-balanced the increasing enrollments for a time, but eventually additional staff in mathematics became necessary. The catalog for 1892-1893 lists the following assistant:

> Martin Everett Rice, B.S. (Kansas University)
> Instructor in Physics Laboratory and in Mathematics.

Rice was listed as a resident graduate student in mathematics and physics in 1891-1892, and he received an M.S. degree apparently in mathematics, in 1893. Professor Rice continued to teach mathematics until 1899; during the years 1896-1899 his title was Assistant Professor of Physics and Mathematics. His connection with the Department of Mathematics ceased in 1899; in 1899-1900 his title was Assistant Professor of Physics and Electrical Engineering. Eventually he was full time in physics; he remained on the faculty permanently.

The establishment of the *Kansas University Quarterly*, a journal "Devoted to the Publication of the Results of Research By Members of the University of Kansas," brought further evidence of increased activity in mathematics. As related in Dean Stouffer's address, Chancellor Snow had recommended, in his first report to the Board of Regents as Chancellor, "the inauguration of a series of official University bulletins through which the investigations and discoveries of our faculty might be made known to the world". This recommendation led to the establishment of the *Kansas University Quarterly*, volume 1 of which appeared between July 1892 and April 1893. The committee of publication consisted of E. H. S. Bailey, W. H. Carruth, E. Miller, F. W. Blackmar, C. G. Dunlap, and S. W. Williston, with Vernon L. Kellogg as managing editor. Kellogg continued as managing editor until July 1893; he left the University to become Professor of Entomology at Stanford University in 1894. W. H. Carruth served as managing editor from October 1893 until January 1901, and H. B. Newson was managing editor from April to October 1901. As early as volume 6, January to October 1897, there was a "Series A--Science and Mathematics", and a "Series B--Philology and History"; the committee of publication and managing editor were the same for the two series. There are indications that series B of the *Kansas University Quarterly* never prospered, for in 1902 the title of the journal was changed to the *Kansas University Science Bulletin*. Volume 1 of the new journal appeared between February and December 1902; it carried the designation Whole Series, vol. 11, which clearly indicates that it was considered a continuation of the *Kansas University Quarterly*.

The *Kansas University Quarterly* supplied several special services in addition to serving as a journal for the publication of research. The *Kansas University Quarterly*, series A, vol. 8, no. 4 (October 1899), pp. 137-174, contains the "Bibliography of Scientific Publications by Members of the University of Kansas". For each faculty member there is a brief curriculum vitae followed by a list of his publications, arranged chronologically by years. This bibliography exhibits the scholarly activities of the faculty in striking fashion. For example, Vernon L. Kellogg received his A.B. degree from the University in 1889; the bibliography lists 19 papers (one is a book) which he had published by the time he departed for Stanford in 1894. The bibliography also lists 84 papers and books published by Francis Huntington Snow, and 150 papers published by Samuel Wendell Williston. The First Supplement to the "Bibliography of Scientific Publications by Members of the University of Kansas" was published in the *Kansas University Quarterly*, series A, vol. 10, no. 4 (October 1901), pp. 149-158. The bibliography and its First Supplement list ten publications (one is a textbook on trigonometry) for Ephraim Miller and twenty-seven publications for H. B. Newson. Also, pp. 159-168 of the same number of the *Kansas University Quarterly* contain the "List of Publications Received in Exchange for the *Kansas University Quarterly*". This list shows that 347 publications were being received in exchange from all parts of the United States and the world; a few of them were mathematics journals. The University was being advertised in the best possible manner, that is, through the publication of faculty research. Furthermore, the exchange of publications added enormous strength to the library and the "List of Publications Received . . ." provided a valuable catalog of journals in the library. Finally, this same issue contains (pp. 169-176) a table of contents of volumes 1 to 10 of the *Kansas University Quarterly* (both series A and B) and (pp. 177-185) an index of authors for the same period. The only thing not provided are brief reviews or abstracts of the papers published!

Members of the Department of Mathematics, students and faculty alike, took advantage of the opportunity to publish papers in the *Kansas University Quarterly* and in its successor. (For a list of the papers on mathematics published in these two journals, see [S, ch. 2, sec. 2].) The record of mathematics papers published in the *Kansas University Quarterly* and in its successor, the *Science Bulletin*, provides convincing proof of the mathematical activity in the Department following the arrival of Henry Byron Newson.

Ephraim Miller was inspired to write a small paper on determinants. Newson published fifteen papers in the *Kansas University Quarterly*, with at least one paper in each of the first ten volumes. His first paper in volume 1 (published in October 1892) emphasizes that he involved his students in research, for he wrote (p. 47):

> This paper contains a summary of the work done during the last school year by my class in Modern Geometry. Since many of the results were suggested or entirely wrought out by class-room discussion, it becomes practically impossible to assign to each member of the class his separate portion. Many of the results were contributed by Messrs. M. E. Rice, A. L. Candy, H. C. Riggs, and Miss Annie L. MacKinnon.

The third paper in volume 1 was written by Henry C. Riggs, a student who received his A.B. degree in 1893; since volume 1 was published between July 1892 and April 1893, this paper was written by Riggs as an undergraduate. The curriculum vitae for him which accompanies his bibliography in volume 8 of the *Kansas University Quarterly* reads:

> Riggs, Henry Clay
>
> A.B. (University of Kansas, 1893). Graduate Student, Department Mathematics, 1894-'95; Teacher, 1895-'97; Graduate Student Chicago University, 1897-
>
> 1892--On Pascal's Limacon and the Cardiod; this journal, i, pp. 89-94.

The Catalogue Number of *The Graduate Magazine* states that H. C. Riggs was a teacher of physics at the Lawrence High School in 1913.

A. L. Candy [S, Appendix IX, Candy], who published a paper in volume 2, was the second student to receive a master's degree from the Department of Mathematics (Olin Templin was the first), and the paper he published was his master's thesis [Wilder 1]. His curriculum vitae in volume 8 reads:

> Candy, Albert Luther
>
> A.M. (University of Kansas, 1892); Ph.D. (University of Nebraska, 1898). Graduate Student, Department of Mathematics, 1891-'92; Instructor in Mathematics, University of Nebraska, 1892-
>
> 1893--The Trisection of an Angle; this journal, ii, pp. 35-45.

The later records made by Olin Templin and A. L. Candy suggest that the Department's standards were high, and there is further evidence to support this conclusion. The "Bibliography of Scientific Publications by Members of the University of Kansas" contains the following entry:

> Growe, Bessie Eleanor
>
> A.B. (University of Kansas, 1897). Graduate Student, Chicago University, 1897-'98; Graduate Student, Department of Mathematics, 1898-
>
> 1897--1. On New Canonical Forms of the Binary, Quintic, and Sextic, this journal, vi A, pp. 201-204.
>
> 1901--2. Removal of any Two Terms from a Binary Quantic by Linear Transformation; Amer. Jour. Math., xxii, pp. 287-296.

But Miss Growe--she was Mrs. Bessie Growe Morrison in 1901--did not receive a graduate degree from The University of Kansas although she had published two papers, one of which appeared in the *American Journal of Mathematics*. The Catalogue Number of *The Graduate Magazine* gave her address in 1913 as the University of Washington, Seattle.

The only other person who published a mathematics paper in the *Kansas University Quarterly* was Arnold Emch, and he is especially important since he is the first person in any field to whom The University of Kansas awarded a Ph.D. degree. Emch received his degree in 1895 [*The Graduate Magazine* 2] although Bessie E. Wilder indicates--incorrectly--that the degree was awarded in 1896. Emch's Ph.D. dissertation, "Projective Groups of Perspective Collineations in the Plane, Treated Synthetically", was published in 1896 in volume 5 of the *Kansas University Quarterly*. The curriculum vitae and bibliography of Arnold Emch in volume 8 of the *Kansas University Quarterly* follows:

Emch, Arnold

M.S. (Kansas Agricultural College, 1894); Ph.D. (University of Kansas, 1895). Graduate student in Mathematics, 1894-'95; Assistant in Graphics, 1895-'97; Professor of Mathematics, Polytechnicum of Biel, Switzerland, 1897-'98; Professor of Graphical Mathematics, Kansas Agricultural College, 1898-'99.

1894--1. On a Special Class of Connected Surfaces; this journal, iii, pp. 153-158.

1895--2. Involutoric Transformations of the Straight Line; this journal, iv, pp. 111-118.

3. Involutoric Transformations in the Plane and in Space; this journal, iv, pp. 205-218.

4. On the Fundamental Property of the Linear Group of Transformations in the Plane; Annals Math., x, pp. 3-5.

1896--5. A Special Complex of the Second Degree and its Relation with a Pencil of Circles; Amer. Math. Month., iii, pp. 127-132.

6. Projective Groups of Perspective Collineations in the Plane, Treated Synthetically (dissertation); this journal, v., pp. 1-36.

1897--7. On the Congruence of Rays (3, 1) and (1, 3); Annals Math., xi, pp. 148-155.

8. On Circular Transformations; Annals Math, xii, pp. 141-160.

9. Mathematical Models; Trans. Kans. Acad. Sci., xiv, pp. 90-94.

(This bibliography fails to include the following paper published by Arnold Emch: "Theory of Compound Curves in Railroad Engineering", *Kansas University Quarterly*, vol. 5, pp. 99-108.) The publication of ten papers in four years suggests that Emch was destined to become a significant mathematician, and he fulfilled his early promise. He was one of the eighty mathematicians in the United States who received a "star" in the First Edition (1906) of *American Men of Science*. (Emch's biography from the Sixth Edition (1938) of *American Men of Science* appears in Appendix IX of the Supplemental Volume.)

Chancellor Snow, observing--among other signs of activity and excellence--the steady publication of mathematics papers in the *Kansas University Quarterly* and the award by the Department of Mathematics of the University's first Ph.D. degree, was proud of the accomplishments of his mathematicians and boasted of their stature. The University's archives contains a copy of the following letter, which Snow wrote to S. R. Vincent of Orie, Oklahoma on April 20, 1896.

Yours of the 18th inst. is at hand, and according to your request I send you a copy of the catalogue. You will observe that for students that are not residents of Kansas the tuition is $10 per annum, a very small amount. We can enter you as

> a special student in Mathematics. We have a very strong department of Mathematics in this University and you will find no better facilities in the United States for advanced mathematical study than can be found here. We shall be glad to have you enroll as a special student in Mathematics.

Beginning in 1881-1882 the University strengthened its requirements for master's degrees, and six years later, in 1888, Henri Nickel received the University's first master's degree for which a thesis was written. Chancellor Snow, spurred perhaps by the award of a Ph.D. degree to Arnold Emch in 1895 by the Department of Mathematics, organized the Graduate School during the academic year 1896-1897 [Hyder 1, pp. 200, 260; Taft 1, p. 75; University Catalog for 1896-1897]. Frank W. Blackmar was appointed the first Dean of the Graduate School in 1897 [Blackmar 1]. At one time he taught mathematics, for we read in Professor Patterson's article about Blackmar's life and work that "Professor Blackmar began his educational work as a teacher in San Jose, California. He was professor of mathematics in the University of the Pacific (Stockton, California) from 1882 to 1886." Dean E. B. Stouffer has recalled the first meeting of the faculty of the Graduate School [Hodder 1]. Held June 10, 1897 in the chancellor's office, it was attended by "the Chancellor and Messrs. Blackmar, Miller, Marvin, Bailey, Sayre, Canfield, Williston, Hodder and Haworth".

The Graduate School, as a separate division of the University, appeared in the University catalog for the first time in 1896-1897. The Graduate School had its own faculty:

F. H. Snow, President, Botany and Entomology.
E. Miller, Mathematics and Astronomy.

W. H. Carruth, German.
F. O. Marvin, Civil Engineering.
E. H. S. Bailey, Chemistry and Metallurgy.
A. M. Wilcox, Greek.
L. E. Sayre, Pharmacy.
A. G. Canfield, French.
L. I. Blake, Physics.
F. W. Blackmar, History and Sociology.
C. G. Dunlap, English.
G. B. Penny, Voice Training, Contrapuntal Harmony, Musical Composition.
S. W. Williston, Historical Geology and Paleontology.
Olin Templin, Philosophy.
F. H. Hodder, American History and Civics.
E. M. Hopkins, English.
E. Haworth, Physical Geology and Mineralogy.
D. H. Holmes, Latin.
H. B. Newson, Mathematics.
W. C. Stevens, Botany.
E. D. Adams, History and Sociology.
A. S. Olin, Pedagogy.
E. C. Franklin, Chemistry.
S. J. Hunter, Entomology.

The catalog explains that "the University offers at present six advanced degrees, viz.: Doctor of philosophy, master of arts, master of science, civil engineer, electrical engineer, and analytical chemist". In outlining requirements, the catalog notes that the master's degree, M.A. or M.S., "will be granted only after at least one full year's resident graduate work". In addition,

> the candidate must have completed with high credit six full courses or their equivalent chosen from the courses of graduate study; other courses may be offered only by the special consent of the departments concerned and with the approval of the administrative committee; but courses for which a professional certificate or diploma is given will not be counted toward this degree. Work may be confined to a single department and may not be distributed among more than three. The candidate must pass a final oral examination upon the courses which he offers for the degree. Not later than the 15th of May preceding the commencement at which the degree is to be taken,

> he must present to the head of the department in which his chief study has been a thesis which must embody some scholarly research on some topic connected with that study.

The 1896-1897 catalog further states that Ph.D.'s would be granted on the basis of "advanced scholarship and the performance of independent work in some special line". The additional requirements for a Ph.D. were:

> 1. The candidate must be a baccalaureate graduate of this University or of a college or university whose degrees are accepted as equivalent to its own; or he must give satisfactory evidence to the Faculty of the Graduate School that he possesses an equivalent preparation for graduate work.
>
> 2. He must make application to the Dean of the Graduate School before the first day of October preceding the commencement at which he intends to present himself for the degree, and must then give satisfactory evidence of his ability to read with fluency such German and French as may be necessary for the proper prosecution of his studies.
>
> 3. He must have spent at least three full college years in resident graduate work at this or some other approved university; the last year must be spent as a resident student of this University. The time spent in attaining the degree A.M. may be counted toward satisfying this time condition.
>
> 4. He must present a thesis showing the results of original research of a high character, and must pass acceptable examinations, both written and oral, in one chief or major study and two allied, subsidiary or minor studies, all of which studies must be in different departments. The oral examination shall be before the Faculty of the Graduate School, where he may be required to defend his thesis. The thesis, embodying the results of original research in some subject connected with his major study, must be presented to the head of the department under whom the work was done not later than the first of May preceding the commencement at which the degree is to be taken, and if approved by him shall be placed on file for inspection in the office of the Dean of the Graduate School for at least two weeks. If finally approved, not less than 100 printed copies must be delivered to the Librarian of the University before graduation, or proper security be given for the printing of that number; provided that, if the thesis has already been printed, 10 copies only shall be deposited with the Librarian.

For the present the departments which offer opportunities for a major course for the degree of Ph.D. are as follows:

Latin.
Economics and Sociology.
Paleontology.
Mineralogy, Stratigraphical and Physical Geology.
Mathematics.

The requirements of "two allied, subsidiary or minor studies" has been dropped; otherwise, the requirements for the Ph.D. degree in mathematics are essentially the same today as when the Graduate School was first organized in 1896-1897. In that year, mathematics was one of five departments authorized to offer the Ph.D. degree. Although the Department of Mathematics awarded only six Ph.D. degrees before 1945, it has been authorized to give this degree throughout the history of the Graduate School. Finally, those in later generations can only marvel at the ability of two professors--Miller and Newson--and a part-time assistant--Rice--to teach the tremendous number of courses, both graduate and undergraduate, that were offered.

The Graduate School section of the 1896-1897 catalog lists the following courses in mathematics (an asterisk indicates a course "not to be taken except upon consultation with the instructor"):

Mathematics

All students proposing to do graduate work in mathematics must have previously taken the undergraduate courses I, II, III, and IV.

*V. Modern Geometry.--Scott. 2nd term. Every day, at 11. Professor Newson.
*VI. Theory of Equations.--Burnside and Panton. 1st term. Every day, by appointment. Professor Miller.
*VII. Advanced Calculus.--Williamson. 2nd term. Every day, at 10. Professor Miller.
*VIII. Differential Equations.-- 1st term. Every day, at 11. Professor Newson.

Courses V and VI are given in alternate years with courses VII and VIII. V and VI will be given in 1897-'98.

IX. Theory of Elliptic Functions.--1st term. Every day, at 12. Professor Newson.

X. Theory of Curves and Surfaces.--Salmon. 2nd term. Every day, at 12. Professor Newson.

XI. Quaternions.--Hardy. 1st term. Every day, by appointment. Professor Miller.

XII. Higher Plane Curves.--Application to curves of the third and fourth order, and of the third and fourth class. 1 P.M. 4 hours per week. 2nd term. Professor Miller.

XIII. Theory of Functions of Real Variables.--Simple and multiple, line, surface and space integrals; series; and geometrical applications. 2 P.M. 2 hours per week. Both terms. Professor Newson.

XIV. Theory of Functions of a Complex Variable.--Special reference is made in this course to the ideas of Riemann. 2 P.M. 3 hours per week. Both terms. Professor Miller.

XV. Theory of Numbers.--Ordinary and complex whole numbers, residues of powers, and quadratic forms. 8 A.M. 4 hours per week. 1st term. Professor Miller.

XVI. Theory of Substitutions.--Groups, Abelian equations, and equations of the fifth degree. 3 P.M. 4 hours per week. 2nd term. Professor Newson.

*The following courses are by appointment:*

XVII. Absolute Geometry.--Non-Euclidean. Professor Miller.
XVIII. Spherical Harmonics.--Professor Newson.
XIX. Logic of Mathematics.--Professor Miller.

Mathematics courses I, II, III and IV (also V through XI!) and courses in astronomy are listed in the undergraduate section of the 1896-1897 catalog as follows:

Mathematics

I. Algebra.--Wells. 1st term, to Christmas vacation. Every day, at 8, 9, and 10. *Required of all Freshmen*. Professor Miller, Professor Newson, and Mr. Rice.

II. Trigonometry.--Miller. From Christmas vacation to middle of second term. Every day, at 8, 9, and 10. *Required of all Freshmen*. Professor Miller, Professor Newson, and Mr. Rice.

III. Analytic Geometry.--*Sophomore alternative*. 1st term. Every day, at 8. Must be preceded by I and II. Professor Newson.

IV. Calculus.--Osborne. *Sophomore alternative*. 2nd term. Every day, at 8. Must be preceded by III. Professor Miller and Professor Newson.

Astronomy

I. Descriptive Astronomy.--Lectures and recitations, with occasional evenings for observation. Young's Astronomy. 1st term. Every day, at 11. Professor Miller.

II. Practical Astronomy, including the Theory of Least Squares.--Use of a sextant and transit instrument, determinations of time, latitude and longitude, etc. Doolittle's Practical Astronomy or Barlow and Bryan's Mathematical Astronomy. 2nd term. Every day, at 11. Must be preceded by Astronomy I, and by mathematics III and IV. Professor Miller.

David Hamilton Robinson died suddenly and unexpectedly in the summer of 1895 while Chancellor Snow was travelling in Europe [Hyder 1, p. 221]. Professor Robinson, a member of the 1866 original faculty of three, had been Professor of Latin Language and Literature, secretary of the faculty, a charter member of the Kansas Chapter of Phi Beta Kappa, and the first Dean of the School of Arts. Chancellor Snow appointed Ephraim Miller to be Robinson's successor as dean. The catalog for 1895-1896 lists Miller as a member of the faculty thus:

Ephraim Miller Ph.D. Mathematics (Allegheny)
Dean of the School of Arts; Professor of Mathematics and Astronomy.

The new degree--Miller had only an A.M. degree before this time--was granted him by Allegheny College, his alma mater. Today his Ph.D. would be called an honorary degree, awarded in recognition of his outstanding accomplishments, rather than an earned degree. The ambitious program of courses for which Miller was listed as instructor in the 1896-1897 catalog seems all the more impressive in the light of the reposibilities as dean which he assumed in 1895. Miller's energy and curiosity, however, knew no bounds. The catalog for 1899-1900 lists him as the instructor for a new course, a "Teacher's Course", and his most ambitious experiment as an astronomer occurred about the same time [Miller 14].

On December 29, 1899, Ephraim Miller delivered a lecture before the Kansas Academy of Science at its annual meeting, held at McPherson, Kansas. In his lecture he described an experiment which he performed on the afternoon of May 3, 1899 with the Clark telescope to observe the corona of the sun. The sun's corona is visible only on those rare occasions when there is a total eclipse of the sun; since the period of totality of an eclipse is short, the period of observation of the corona is correspondingly brief. Miller had begun to prepare his equipment in the latter part of April; his idea was simplicity itself. He attached long wooden strips to the sides of the tube of his six-inch telescope; these strips held in position before the lens a "cardboard moon" to produce an artificial eclipse of the sun. Miller found it difficult to adjust his equipment so that all of the sun's light was excluded from his telescope, but for one brief period on May 3, 1899 he believed that he saw the real corona of the sun. He was not able to repeat his success, however, although he continued his efforts through May and June, and there remained doubt that he had actually seen the sun's corona. Miller's design for his experiment was correct, but his equipment was crude. Astronomers routinely observe the sun's corona today; success depends on the excellence and perfection of the equipment so that all of the sun's light is excluded from the telescope.

During the 1890's there was a great upsurge of mathematical activity in the United States, and the Department of Mathematics of The University of Kansas participated in some of this activity at the national level. The New York Mathematical Society was established in 1888 at Columbia University by Thomas S. Fiske. During part of the year 1887-1888, Fiske had been a student at Cambridge University, England, and had attended meetings of the London Mathematical Society. Although the new society was small--its membership was all in New York City--, a decision was made in 1891 to publish a bulletin and to launch a campaign to increase the membership to provide the financial support required. Ephraim Miller was elected to membership in the New York Mathematical Society in May 1891, apparently as a result of this campaign. (H. B. Newson did not become a member until October 1895.) The 1891 campaign was highly successful, with the result that the membership of the New York Mathematical Society became national in character. On July 1, 1894, the organization's name was changed to American Mathematical Society [Archibald 1, pp. 3-7, 74].

Another event occurred about the same time which proved to have great importance for mathematics and for The University of Kansas: the University of Chicago was founded in 1892. The new university brought together a strong and notable group of mathematicians under the leadership of Professor E. H. Moore--a group which included H. Maschke and O. Bolza. Under the leadership of these mathematicians, a highly successful International Mathematical Congress was held in Chicago, August 21-25, 1893, in connection with the Columbian Exposition. Raymond Clare Archibald wrote the following description [Archibald 1, p. 74]:

Early in 1893 the local comm. for math. and astr. (Moore, Bolza, Maschke, H. S. White) had sent invitations to a large number of eminent specialists in these sciences in American and European countries. The response was gratifying, and in the case of Germany, Felix Klein came over at Kaiser Wilhelm's personal request, as an Imperial Commissioner to attend the Congress. He brought nearly all the mathematical papers contributed by his countrymen, and he cooperated effectively with the local committee in the preliminary arrangements. Klein's duties required him to lecture and to demonstrate the educational exhibit (books and apparatus) of the German Empire. In this first International Congress of Mathematicians the following seven countries participated: Austria, France, Germany, Italy, Russia, Switzerland, and the United States.

Under the enthusiastic leadership of E. H. Moore at the University of Chicago and H. S. White at Northwestern University, frequent conferences and informal discussions developed among the mathematicians at the two schools. These activities soon led to plans for a formal organization that would include all of the mathematicians in the Midwest. Archibald has recorded the history of these events [Archibald 1, pp. 74-81]. A printed circular, sent out in early December of 1896 to students and teachers in neighboring institutions, announced:

A CALL TO A CONFERENCE IN CHICAGO

To Members of the American Mathematical Society:

Our Society represents the organized mathematical interests of this country. Its function is to promote those interests in all possible ways.

Do we not need most of all frequent meetings? Those who have attended the summer meetings know the keen stimulus and inspiration resulting from personal contact--inside and outside the stated meetings--with colleagues from other institutions. The regular monthly meetings of the Society afford similar opportunities to those who live in the vicinity of New York.

By the organization of *sections* of the Society can similar advantages be secured for other parts of the country? Shall, for instance, a Chicago section be organized? Obviously only if the members of the Society residing in the vicinity of Chicago wish the section organized and are willing to support sectional meetings by attendance and by the contribution of papers. How shall the sections be related to the Society?

Those members of the Society who may be interested in the consideration of these and cognate questions we invite to meet in conference in Chicago during the coming holidays. The conference will convene in room 35 of the Ryerson Physical Laboratory of the University of Chicago at 10 o'clock, Thursday forenoon, December 31, 1896. It is expected that the conference will have three or four sessions and will adjourn on Friday, January 1, 1897. The deliberations of the conference may result in recommendations to the Society or the the Council of the Society.

The programme of the conference will of course include the reading of mathematical papers. These papers should represent the various lines of mathematical activity of those in attendance. It is requested that titles and time-lengths of papers to be read be sent as early as possible to E. H. Moore. . . . (signed) E. H. Moore, O. Bolza, Thomas F. Holgate, H. Maschke, Henry S. White, W. W. Beman, E. M. Blake, John E. Davies, Ellery W. Davis, H. T. Eddy, E. A. Engler, A. Hall, Jr., Harris Hancock, M. W. Haskell, A. S. Hathaway, E. W. Hyde, Malcolm McNeill, E. Miller, H. B. Newson, James Byrnie Shaw, David Eugene Smith, W. B. Smith, E. J. Townsend, C. A. Waldo, L. G. Weld, C. B. Williams, J. W. A. Young, Alexander Ziwet.

According to Archibald, the following seventeen AMS members attended the Chicago conference: H. Hancock, H. Maschke, E. H. Moore, and J. W. A. Young from the University of Chicago; J. B. Shaw and E. J. Townsend, University of Illinois; Estella K. Wentz, Industrial Training School, Indianapolis; H. B. Newson, University of Kansas; P. H. Philbrick, Lake Charles, Louisiana; M. McNeill, Lake Forest University; T. E. McKinney, Marietta College; A. Ziwet, University of Michigan; E. W. Davis, University of Nebraska; T. F. Holgate and H. S. White, Northwestern University; E. M. Blake, Purdue University; and C.H. Chandler, Ripon College. During the course of the meetings, fourteen papers were presented;

a temporary organization, with Professor Moore as chairman and Dr. Blake as secretary, was established; and a committee consisting of Ziwet, Shaw, and Blake was appointed to formulate a plan of permanent organization for a local section of AMS.

The American Mathematical Society responded favorably to the actions of this conference. The second conference of the Chicago members of the Society was held on April 24, 1897 and, in accord with the action of the Council of the AMS, organized itself into the Chicago Section of the American Mathematical Society. Both Ephraim Miller and H. B. Newson had signed "A Call to a Conference in Chicago", and Newson attended the conference on December 31, 1896 and January 1, 1897.

The report of the April 24 meeting at which the Chicago Section was formed, states that H. B. Newson gave a paper entitled "On canonical binary forms". A regular meeting of the American Mathematical Society was held in New York City on the same day; the report of that meeting states that five members were present, and that three papers were read, one of which was entitled "Continuous groups of circular transformations", by H. B. Newson. It is not possible to say which, if either, of these two simultaneous meetings Newson actually attended. In neither case does the report of the meeting state that his paper was read by title or by another. The fourth summer meeting of the Society was held at the University of Toronto, August 16 and 17, 1897; H. B. Newson was present and read a paper entitled "On the Riemann-Helmholtz-Lie problem of the foundations of geometry". The second meeting of the Chicago Section of the AMS was held at Northwestern University on December 30 and 31, 1897; H. B. Newson was present and had two papers on the program. Both of these papers were labeled as "preliminary communications", and one was a joint paper with Professor Hathaway of Rose Polytechnic Institute. The fourth meeting of the Chicago Section of the AMS was held at the University of Chicago on December 29 and 30, 1898; Professor Newson was present and presented three papers. The report of the meeting contains summaries of two of these papers. The ninth summer meeting of the American Mathematical Society was held at Northwestern University on September 2 and 3, 1902; H. B. Newson was present at this meeting and presented a paper. The twelfth regular meeting of the Chicago Section of the AMS was held at the University of Chicago on January 2 and 3, 1903; Newson was present and gave a paper. Furthermore, "in the absence of the President or a Vice-President of the Society, Professor H. B. Newson was elected chairman of the Section". This election was a distinct compliment to Professor Newson since there were such distinguished mathematicians as Oskar Bolza, H. Maschke, E. H. Moore, F. R. Moulton, J. B. Shaw, and Henry S. White present at the meeting.

This list of meetings attended and papers read by Professor Newson is only a sample of his activities; it is not an exhaustive list, even for the years 1896-1903. A complete record can be prepared by examining the reports of meetings in the *Bulletin of the American Mathematical Society*. This sample of Professor Newson's activities has been given, however, in order to demonstrate the nature and extent of his activities as a mathematician and his participation in mathematical affairs at the national level. Newson's activities in research, publication, and attendance at national meetings provided the background for, and justified, the award of a "star" in his biography in the First Edition (1906) of *American Men of Science*, and his inclusion in the group of the eighty leading mathematicians in the United States. Three final comments are in order. First, nothing has been found in the printed records of The University of Kansas which would indicate that the extent of Professor Newson's activities and the degree of his distinction as a mathematician were understood on the campus. Although the University has boasted often of its distinguished faculty members and graduates, it has never really discovered Henry Byron Newson. Robert Taft, in *Across the Years on Mount Oread*, mentioned Newson only to say that he was absent when the 1892-1893 faculty photograph was made [Taft 1, p. 44]. Newson's name does not occur in Hyder's biography of Chancellor Snow [Hyder 1]. Second, the accounts of Newson's activities both on and off campus describe a heavy load of work that led eventually to his early death in 1910. Third, there is no record of the source of the funds that paid his travel expenses for the many meetings he attended!

After commencement in 1900 Chancellor Snow had a breakdown in health--a complete collapse--caused by the strain of ten years of responsibility as chancellor, by concern for Mrs. Snow's health during 1898 and 1899, and finally by the loss of his oldest son, William Appleton Snow, in an accident in October 1899. His son, a reporter for the *San Francisco Chronicle*, fell from a tugboat which had gone out to meet a troop transport returning the Twentieth Kansas Regiment from Spanish American War campaigns in the Phillipines [Hyder 1, pp. 225-226; Taft 1, pp. 60-61]; his body was never found. During the summer Chancellor Snow sought rest and recuperation, but he was unable to regain his strength. Later in the year he requested and was granted leave. William C. Spangler was appointed acting chancellor once more. It soon became evident to Snow that he would not be able to resume his duties as chancellor, and, on June 4, 1901, he submitted his resignation, to become effective on September 1 of that year [Hyder 1, pp. 225-227]. On April 16, 1902, the regents elected Frank Strong the sixth chancellor and Snow's successor.

Chancellor Strong was inaugurated with elaborate ceremonies that filled three days, October 16-18, 1902. These inauguration ceremonies have been described by Taft [Taft 1, pp. 74-76], and the addresses given by the distinguished speakers were published in *The Graduate Magazine*, vol. 1 (1902-1903), November 1902, no. 2.

During the 1880's and 1890's, the University campus had grown considerably. Chancellor Marvin had built Chemistry Hall in 1883 (a small building located at the east end of the present Watson Library); Chancellor Lippincott had built the original Snow Hall in 1886 (located north of Watson Library) as a natural history building for Professor Snow; and Chancellor Snow had succeeded in adding six buildings to the campus. In 1891 the University received a legacy of nearly $100,000 from William B. Spooner, a resident of Boston and an uncle of Chancellor Snow. With these funds the University built Spooner Library (now Spooner-Thayer Art Museum) and the chancellor's residence; both were completed in 1894 [Hyder 1, plates facing pp. 224 and 225; Taft 1, pp. 58-60]. A gift of $21,000 in 1898 from George A. Fowler of Kansas City provided funds for the construction of the original Fowler Shops, now Flint Hall; the building was completed in 1899 [Taft 1, pp. 61-63]. In the meantime, the legislature had appropriated funds for the construction of the original Blake Hall, the physics building, completed in 1895. The legislature appropriated funds also for Bailey Hall, originally the chemistry building, which was completed in 1900 but formally dedicated as a part of the inauguration ceremonies for Chancellor Strong [Taft 1, pp. 70-71, 75-76]. Finally, the legislature provided funds for Dyche Museum, partly, at least, as a result of the national attention Dyche had focused on the University and the state, especially with his display of mounted animals in the Kansas building at the 1893 Columbian Exposition in Chicago [Taft 1, pp. 71-73]. Chancellor Strong's inauguration ceremonies were held in Dyche Museum, which, barely completed, still lacked some of its finish and polish [Taft 1, pp. 71-73]. Chancellor Snow spoke at Strong's inauguration; his address was brief, the most significant part of it being a summary of the accomplishments of his administration [Snow 2; S, ch. 2, sec. 3].

Francis Huntington Snow had been a remarkably successful chancellor; it seems likely that the University's fame reached its peak during his administration. Hyder has written [Hyder 1, p. 268] that "Eliot [President of Harvard University], who visited the University in 1900, was once quoted as placing the University of Michigan and the University of Kansas first among the institutions of the West, and President Angell of Michigan also ranked Kansas, because of its faculty, high among the best state universities". But rapid growth brings serious problems. As Chancellor Snow pointed out in his address, during his administration, the enrollment increased from 505 to 1154, the faculty from 34 to 79, and the appropriations from \$75,000 to \$135,000--the latter not in proportion to the increases in enrollment and faculty. Chancellor Strong, however, not content with the growth already achieved, began his administration with large plans for increasing still further the University's enrollment and also its services to the state [Taft 1, p. 74]. Chancellor Strong realized immediately that both to consolidate the gains already achieved and to carry out his ambitious plans for further expansion, the University would need increased appropriations, buildings, faculty, and strengthened faculty leadership.

The School of Arts (renamed the College of Liberal Arts and Sciences by the regents in 1904 [Taft 1, p. 78]) was one of the first to claim Chancellor Strong's attention. Ephraim Miller was its dean, and in 1903 he reached the age of seventy. There was no retirement age then, either for administrators or for faculty members; in fact, there was no provision for anyone to retire. Chancellor Strong's plans, however, required a younger and more vigorous dean. There are two accounts of the events that transpired: one is a part of the folklore of the University, and the other is the official record based on the correspondence that passed between Strong and Miller. Although the folklore account and the official record differ greatly in detail, they are fundamentally consistent.

The legendary account of Ephraim Miller's replacement as dean is that Miller found his duties as dean confining if not irksome. Eventually, he had a rubber stamp made with his signature on it. He gave the rubber stamp to his secretary and said, "If anyone requests anything, give my approval with this rubber stamp". Encouraged by these instructions, the secretary approved all requests. The abuses that resulted became so excessive that Chancellor Strong was finally forced to relieve Miller of his position as dean. This episode accounts for the fact that rubber-stamp signatures have been frowned upon in the University ever since Dean Miller's time. There is some factual evidence to support this account: Dean Waggoner states that he has in his possession a card which bears Dean Miller's rubber-stamp signature.

Chancellor Strong appointed Olin Templin to replace Ephraim Miller as dean. The official account of Dean Templin's appointment is contained in the following letters written by Chancellor Strong and Dean Miller. (The letters are reprinted here from copies in the University's archives.) On April 7, 1903 Frank Strong wrote to "My dear Professor Miller":

> I wish to ask your advice and co-operation in regard to a matter of much importance to the University. I wish to enlarge the work of the deans of the various schools and especially of the School of Arts. This will mean a large

burden of detail work which I feel ought not to rest upon you after your long labors for the University, and should be shouldered by a younger man. The work will be much more exacting than at present and will bring an amount of worry and responsibility that I feel you ought not to be asked to undertake. However, neither the Board of Regents nor myself, I am sure, would want to do anything not agreeable to you.

In case you should think this to be wise, I should feel it best to place the burden of the deanship of the School of Arts upon a younger man, but should feel that your long and valuable services demand that you continue to draw a dean's salary in recognition of what you have done here.

I have written you frankly about this matter, hoping for your frank advice in return. If the matter should prove distasteful to you, we will let it drop.

Several months later, on July 23, Strong wrote to Scott Hopkins, a member of the Board of Regents, outlining his ideas for the School of Arts and asking for Hopkins' advice on how to handle the "delicate matter" of appointing a new dean.

I wish to inaugurate a new scheme of oversight of the students of the University. It will be a system of advisers who will act with and under the deans of the different schools. Our most important department is the school of arts and it is of great moment to us that the students in that department be efficiently handled. The present dean is an old man--over seventy years of age as you know, and I have long felt and a number of the most responsible men in the University have felt that conditions were not favorable for the work of the dean being done in the most efficient manner. It is a very delicate matter to handle and sometime ago I wrote to the present dean, saying in substance that we wanted to do everything that was reasonable for him and that we felt that a younger man could undertake more work in that line than we would think of expecting him to do and asking him frankly what his ideas in regard to the matter were. He seemed to be unwilling to relinquish the work. I therefore hesitate about beginning the new scheme under the present circumstances and yet it must be done somehow. The man I would choose to act as the new dean hesitates about undertaking the work at all unless he can begin his work with the new scheme and be sure that it starts right and works well. You are a far-seeing man about such things and have handled more than one difficulty for us and I would like to advise with you about the matter. If it would not be at all inconvenient for you to be in Lawrence Friday or Saturday I would like very much to have a talk with you.

On August 20, Strong again pressed Miller to resign as dean.

I did not expect to write you again so soon about the deanship of the School of Arts. However changed conditions make it best. I have talked to some members of the Board who are friends of yours and they thought it wise to write you frankly and state the way in which it seems to me now. I have thought the matter over very carefully while here on vacation for I am your friend and you are mine, I am sure. In outlining the scheme for a new system of oversight of students, I find that it will be best to have the new man who would assume the duties of dean in the course of nature, begin the work and start the new system. Otherwise, I shall be somewhat embarrassed in my plans. Then too, I feel that it will be best for the University and for yourself to have all your energies given to your department, which is bound to grow rapidly and in (word illegible) most important in the University. For, after all, this is the matter of the most importance, while the deanship is secondary. I feel also that you would be spared much longer to the University and be of the most benefit to us in this way.

Then too, I am sure that I could have the arrangement made now for the Board to pay you a dean's salary, $2300, which undoubtedly will be the salary for some years. How it would be in a year or two I do not know. For by that time there will be many more demands on the General Fund and such arrangement might be more difficult.

I have carefully kept any possible knowledge of this from any one who might not have a kindly feeling for you, if there be any such. On the other hand, I believe there is no one in the Faculty for whom all of us, Board and instructors, have a more sincere regard than yourself.

We have already talked over who ought to succeed you and it is, at least partly, because of your very favorable comment upon him that I continued to think of him in this capacity. He of his own volition talked with you the other day, but

> told me about it later. He then said that as far as he was concerned, he had ceased to consider the matter and wished to give it up. But after careful consideration I feel that it would be best for all to follow the plan I have outlined. You have more than once said that you wished to do what was for the best of the University and for my administration. I wish to thank you for it, and for many other kind works and shall hope for your kindly interest and advice in the future.

The chancellor's insistence took Miller by surprise; he immediately wrote back:

> Your favor of the 20th Inst. reached me yesterday. I read it and felt as if Jeffries had struck me between the eyes. Especially so after remembering that you said in your note of April 7, that "if the matter should prove distasteful to you, we will let it drop". Also in our conversation a few days afterward, it was agreed, as I thought, to let the matter rest until I should have a trial and then if the work should prove too heavy for me, I would cheerfully resign the Deanship. But I wish harmony. I do not intend to block the wheels of progress. I shall give you my cheerful support, and in all things I shall render hearty service. But in resigning the Deanship, I do so with the explicit understanding that my salary shall always be the same as that of a Dean, and not otherwise.
>
> I therefore resign as Dean of the School of Arts in the University of Kansas.

On August 31, in accepting Miller's resignation, Strong explained that "circumstances" had forced him to act decisively on the matter.

> Your letter of August 27th was received on my return. Please accept my thanks for the same. I had not expected and hoped that it would not seem best to do anything more in regard to the matter in question for some time at least, and as you

> remarked, I did say that if it should prove distasteful to you it would be dropped, and when we talked the matter over it was decided that you should attempt the work and if it proved too much for you to do, that you should then relinquish it. But as you well know, in all matters of administration, arrangements which are entered into with entire sincerity, must sometimes give way to circumstances that arise later and which cannot be foreseen. This is a case of that sort and it seemed best for the interest of the University and all concerned, that the matter should come up again much earlier than I had supposed. In all such cases the administration must decide matters without fear or favor and must make such arrangements as seem to be necessary because of new conditions.
>
> In regard to the matter of salary, of course that question would have to go to the Board of Regents and I am sure that they will make your salary that of the present dean's, and so far as anyone can tell now, that will be the salary for sometime to come. Anything further than that would have to be fixed by the Board itself.

Three days later, on September 2, Chancellor Strong wrote a letter (a copy is in the University's archives) to one of the regents, Thomas M. Potter in Peabody, Kansas, to request that Olin Templin, Strong's choice as dean, be confirmed by the Board. Strong stressed the need for prompt action so that his "new scheme for the oversight of students" could begin at once.

> I have been seriously considering for some time one of the most important matters connected with the administration of the University--that is, the continued oversight of students, especially of the School of Arts. There never has been, I understand, an efficient scheme for the oversight of students and I have felt strongly that this was one of the great lacks of the University.
>
> This matter must be administered under the control and direction of the deans of the various schools. It has been evident to me for some time that the interests of the University demanded that the deanship of the School of Arts, in some respects the most important position under the Chancellor, should be held by a man who is younger than the present incumbent and who is adapted to detail work of this kind and enjoys

such work. Such men are very scarce.

I spoke to the Board about this matter of the deanship at one of the Spring meetings. After talking with Professor Miller, the present dean, it seemed best to let the matter drop and I did not expect to take it up again for a year or two. However, when I came to outline the scheme for the oversight of students, it became evident that the interests of the University required that the man who in the course of nature would shortly succeed to the deanship, should begin and carry out the new scheme. I therefore wrote again frankly to Professor Miller and he has sent in his resignation to me. I have accepted it as far as I am concerned as Chancellor.

I have given the matter of Professor Miller's successor very careful consideration, and have consulted with graduates and teachers of the University whose judgment would be of most worth, and I believe that Professor Olin Templin is best adapted to undertake this very important work. One thing that weighed strongly also, was that Professor Miller was in favor of him.

The new scheme for the oversight of students must be put in operation at the beginning of the year, September 9th, and many plans must be made by the new dean. It is therefore necessary that he begin at once. I have therefore designated Professor Templin as dean of the School of Arts, subject to the confirmation of the Board and I earnestly recommend him to you. I hesitated about calling a meeting of the Board because so few things demand attention before September 9th.

Professor Miller has served the University for many years faithfully and efficiently and is now at a time of life when none of us could expect to have much power over details. I therefore earnestly recommend that his resignation be accepted and that he be granted the present deans' salary $2300. This would be a worthy tribute to his long service and faithfulness.

Following Chancellor Strong's recommendation, the Board of Regents confirmed Olin Templin's appointment at their meeting on October 21, 1903. Events proved that Chancellor Strong had chosen one of the real giants of the University to be the new Dean of the School of Arts. As we know, Olin Templin studied mathematics, he had received the first master's degree awarded by the Department of Mathematics, and he had taught mathematics for several years. Apparently Chancellor Snow knew a philosopher when he saw one, however, for in 1890 Snow appointed Templin Associate Professor of Philosophy. Templin soon demonstrated that he had the instincts and interests of a philosopher rather than those of a mathematician. Although he was a philosopher, he was not a dreamer but rather a man of action, as Dean Stouffer has emphasized [Templin 3]. In 1897 Templin gave the Annual Address before the Phi Beta Kappa Society on "The Duty of the State to the Scholar", and published it in the *Kansas University Quarterly* [Templin 6]. This address reveals much about Dean Templin and foreshadows his most important activities in the University in later years; his address ends with the following summary.

> These, then are the duties of the state to the scholar because of his usefulness to society in its efforts to attain its highest life:
>
> First, he must be secure in such a degree of personal comfort as will make most certain his greatest usefulness.
>
> Second, he must be supplied with all the materials and instruments that he can profitably employ in the performance of his duties.
>
> Third, he must be given every possible opportunity to serve society in his capacity as scholar.
>
> Fourth, his emancipation must be guaranteed him irrevocably. No competent, righteous state will fail to discharge these duties promptly, fully, and with enthusiasm.

In his address, Templin explained the value of, and need for, private gifts and endowments to support scholars and universities. He also had much to say about the obligation of the state to supply buildings and facilities and materials and instruments of all kinds to support the work of scholars. These ideas motivated the most important activities of Templin's life.

The first number of *The Graduate Magazine* appeared in October 1902, the same month in which Chancellor Strong was inaugurated. The last page of this first number contains a letter "To the Alumni" from Olin Templin, Chairman of the Executive Committee of the Alumni Association [Templin 7]. This letter to the alumni explains the plans and hopes for *The Graduate Magazine*. Professor R. D. O'Leary, '93, Professor of English, was the managing editor. One of the early goals of *The Graduate Magazine* was the collection and publication of the early history of the University, and the early volumes are full of history and biography. Another goal was to build a strong Alumni Association--*The Graduate Magazine* was its official publication--which would promote, through gifts and through influence on the state and on the legislature, the welfare of the University. *The Graduate Magazine* was used, especially from 1902 to 1920, to organize campaigns to influence the legislature concerning legislation and appropriations affecting the University.

At first, the Alumni Association was a weak organization without funds: one dollar paid for dues and a one-year subscription to *The Graduate Magazine*. Under Dean Templin's leadership, *The Graduate Magazine* bought printer's type and sufficient equipment to set type for printing the journal; it was printed on commercial presses in Lawrence. Later, *The Graduate Magazine* bought printing presses and did the printing also. About 1912, the Alumni Association sold the printing plant it had assembled for printing *The Graduate Magazine* to the University, and this equipment formed the beginning of the present University Printing Service [*The Graduate Magazine* 4, 5]. In due time, *The Graduate Magazine* itself published a complete history of the Alumni Association, of the founding of *The Graduate Magazine*, and of its editing and publication for more than twenty years [*The Graduate Magazine* 3]. Dean Templin stayed in the background, but his was the vision and the driving energy that developed the Alumni Association and *The Graduate Magazine* into powerful instruments for the support of the University.

Dean Templin also played a leading role in the planning and building of some of the most important buildings on the campus. The February 1910 number of *The Graduate Magazine* contains a description of, and a photograph of the architect's drawing of, the "new building"--the present Strong Hall [Templin 8]. The preliminary plans for this building were developed by Dean Templin and Professor Griffith; as finally built, the structure is considerably less imposing than the original design. Also, Dean Templin proposed a chime tower and pioneer memorial [Templin 2, 4]; the Campanile is a partial realization of these dreams and plans.

The Kansas University Endowment Association was established in Topeka on October 31, 1891; the November 1904 number of *The Graduate Magazine* describes a reorganization of the Endowment Association at a recent meeting at which Olin Templin was one of several men elected to the Board of Directors. The November 1920 number of *The Graduate Magazine* describes another reorganization of the Endowment Association at which Chancellor Lindley was elected president and Olin Templin (no longer dean) was elected secretary [Templin 10]. Templin spent the remainder of his life promoting the welfare of the University through his position as Secretary of the Endowment Association. The immediate occasion for the 1920 reoganization was the launching of a campaign to raise one million dollars to build the stadium and the Kansas Union as World War I memorials. Later there were gifts to support the Summerfield Scholarships, to build scholarship dormitories, and to support various activities of the University. Dean Templin performed an enormous service for K. U. by developing the Endowment Association into a powerful agency for soliciting gifts for the University. Templin Hall, named in honor of Olin Templin, perpetuates the memory of the contributions of a distinguished mathematician-philosopher on the University's faculty.

In the early days some of the best educational activities of the University were carried on in informal settings that included both students and faculty. The Science Club--which existed from January 1885 to June 1896--provides an excellent example. Although the Science Club carried on a serious scientific program, it is best remembered for the fun and merriment that were a part of its annual banquet. Professor E. H. S. Bailey has assembled the principal facts in the history of the Science Club and collected the reminiscences of its members [Bailey 3, 5, 6]. In the first of his three articles Professor Bailey describes the activities of the Science Club:

> The principal activities of the Science Club, from the beginning were: I. The holding of meetings on every other Friday evening, for the reading and discussion of scientific papers, to bring out the work which was in progress under the direction of the faculty in the Scientific Laboratories, also to keep in touch with scientific progress in each line by having reports frequently made. II. The holding of an Annual Meeting at which all the original scientific work of the year was reported by faculty and students. III. Some time during each winter the annual banquet of the club known as the "It" was held. IV. The maintenance of a library of scientific periodicals. V. A series of excursions was inaugurated by the club. Some of them were Archeological, Geological or Biological for study and instruction; others were made for the purpose of visiting Industrial or Engineering establishments.

This description of the Club's activities emphasizes the serious side of its program and does not portray adequately the recreation and entertainment that were included incidentally. The Science Club had many picnics at "Uncle Joe" Savage's farm near Lawrence. The University's Rock Chalk yell had its origin in these picnics and other extra-curricular activities of the Club [Bailey 6]. But the annual banquet known as the "It" has contributed most of the reminiscences of the Science Club; Professor Bailey has given us an account of this unique event [Bailey 6].

> It is perfectly natural that more "memorabilia" come to us in regard to the Annual Banquet with its burlesque program, which was known as the "It" than about anything else that concerned the Science Club. This was different, it was unique, and naturally would cling to the memory, when all thoughts of scientific meetings had faded.
>
> The naming of the function as the "It" should be credited to Professor Marvin. On one occasion when the question came up, "What shall we call it," he responded quickly, "Call it the 'It'", and all were immediately agreed that the name was most appropriate. This meeting came to be the annual clearing house for all the jokes of the year, for anything that could be "pulled off", on the work or avocation of the faculty or students--for such a spirit of good fellowship prevailed that nobody felt in the least offended, as we all knew that it was "in fun". The meeting was in fact carried out in the line of the "Gridiron Club" with all the variations that the fertile minds of the students or faculty could suggest.

The most famous and dignified members of the faculty participated in the fun and merriment--in the "burlesque program"--of the "It". Professor Bailey has left us two samples of "It" humor [Bailey 3].

> Professor Miller, now the senior member of the faculty, 1926, writes: "I remember that at one meeting Professor Carruth (an invited guest) read a poem to commemorate the birth of a child in W. S. Franklin's family, which was the outstanding funny paper of the evening. It was the description of the feelings of 'Dad' Franklin in mixed English and German."
>
> There is probably no other incident connected with those meetings of the "It" that is recalled by more old students than Professor Templin's hypnotic exhibition. It seems that

> it had been previously understood between Templin and Eames as to the part each was to take, but to us in the audience who were perfectly ignorant of this understanding, the whole thing seemed spontaneous and was what would be at present denominated a "scream". At a given signal from Templin, Eames, who was on the other side of the room, gradually arose and fixed his staring eyes on the professor and, as if drawn by a magnet, went towards him, over chairs, tables, dishes and students. Then he was told he was a dog, and ran around on four feet and barked; with a snap of the fingers he was brought out of that conception, and was told he was a squirrel, and sat on his haunches and chewed crackers, and climbed the posts to the ceiling.

The Science Club held its last meeting in June 1896; it was discontinued partly because the chapter of Sigma Xi had been established in 1890, but also because the growth of the University made it impossible to encompass the work of all of the science departments in a single seminar--for, in fact, the serious programs of the Science Club would be called a seminar today. But some traditions which originated in the annual banquet known as the "It" have survived on the campus. One example is provided by a talk entitled "Mercaptans or Any Other Old Stink" by Professor H. P. Cady which is included in the fifty-year history of the Kansas Chapter of Sigma Xi [Sigma Xi 3]. Professor Cady gave this talk on March 17, 1938, when Sigma Xi honored four faculty members (W. C. Stevens, M. E. Rice, F. B. Dains, and H. P. Cady) who had been members of Sigma Xi for more than forty years. Professor Cady claimed that he gave his paper the first time when he was initiated into Sigma Xi at the "19th meeting, February 1, 1897". A talk was required as a part of his initiation, and the title of his talk, "Mercaptans or Any Other Old Stink", was assigned by Professor A. St. Clair Dunstan, a physicist and the Secretary of Sigma Xi. The minutes of the meeting record the fact that the four initiates, one of whom was Cady, gave short talks, but there is no description of these talks; the program of the meeting consisted of a paper entitled "Fears" by Professor Templin. Professor Cady claims that, at his initiation, he treated his subject in the spirit that was intended. He described with mock seriousness an experiment which he had performed. The experiment involved physics and chemistry, and to those with little scientific learning it might sound almost plausible. It was--and is--a hilarious short story, a bit of science spoofing. It is perhaps one type of science fiction, a type that must be recognized as science burlesque.

A second example of a tradition that originated in the "It" of the Science Club occurred more than fifty years later. For many years Sigma Xi had an annual banquet in the spring, and there was a tradition that humorous entertainment was a part of the program at this banquet. The tradition, however, gradually died out; but the last example of scientific fun at a Sigma Xi banquet occurred many years later and was worthy of the best traditions of the "It" in the days of the Science Club. Professor A. Byron Leonard was President of Sigma Xi during the two-year period from 1952 to 1954. One of the president's duties was to give a retiring presidential address. Professor Leonard elected to discharge this obligation at the annual banquet of Sigma Xi in the spring of 1954, providing thereby the entire program for the banquet. I had been elected president to succeed Professor Leonard; I introduced him when it came time for him to give his address. Unsuspecting, I read the title of a serious scientific paper on a new order--the *buttonidae*--of fossil shell fish that Professor Leonard had discovered. Professor Leonard's paper was profusely illustrated with slides of his fossil discoveries, but the details could not be seen clearly because the photographs were not very clear. As the talk proceeded, Professor Leonard criticized--sometimes slyly, sometimes pointedly--his colleagues for their various scientific oversights and failures. One wondered--but then the account of the *buttonidae* was developed with such elaborate scientific detail that they must be real--or have been real in geologic ages past! Some of Professor Leonard's specimens had two holes, undoubtedly for the circulation of water, and others had four holes. There was a complete account of the differences between the males and females. But the slides became clearer and more distinct--the focus of the camera that made the photographs shown in the slides improved progressively. Finally, the hoax was undeniable: the *buttonidae* were buttons!--and the whole address was a mock serious and mock scientific account, *a la* paleontologists, of an assortment of buttons that Professor Leonard had bought at Kresges. But the account of the *buttonidae* was such a flawless report on a scientific paleontological research project that some of those at the banquet never realized the hoax. Mrs. Kester, wife of Prof. Kester of the physics department, was heard to say as she left the banquet, "Professor Leonard's paper sounded very interesting, but I am afraid that I didn't understand any of it."

But along with the fun and humor in the Science Club and Sigma Xi, there was much serious work. The following list contains the names and thesis titles of all those who received, through 1910, master's degrees in mathematics from The University of Kansas.

| | |
|---|---|
| 1889 | Templin, Olin<br>A Method of Dealing with Continuous Fractions (Lost) |
| 1893 | Candy, Albert Luther<br>The Trisection of an Angle (Lost) |
| 1893 | Rice, Martin Everett<br>The Inverse of Conics and Conicoids from the Center (Lost) |
| 1901 | Brewster, Helen B.<br>On Collineations in Space Which Leave Invariant a Quadric Surface |
| 1902 | Owens, Frederick William<br>On Some Physical Applications of Hamilton's Operator |
| 1904 | Keplinger, Fred<br>Continous Groups of Projective Transformations in Two Dimensions |

1905 Shirk, James Abram Garfield
(There is no record of Shirk's thesis nor of its title.)
1907 Mitchell, Ulysses Grant
Certain Continuous Groups of Projective Transformations Treated Analytically
1907 Pitcher, Arthur Dunn
An Analytical Determination of Certain Line Groups in the Plane

The careers of Olin Templin and Albert Luther Candy have been described already, and it is not necessary to add anything at this time.

Bessie E. Wilder's catalog of Graduate School theses [Wilder 1] lists a thesis for Martin Everett Rice in 1893; she stated that the title was "The Inverse of Conics and Concords from the Centre" and that Rice probably received a degree in physics. M. E. Rice received an M.S. degree in 1893, but the thesis has been lost and direct verification of the field of the degree has proved to be impossible. The word "concords" in the title should be "conicoids" (see Rice's biography in the First Edition of *American Men of Science* [S, Appendix IX, Rice]), and the evidence seems conclusive that Rice received his master's degree in mathematics. The title (corrected) given by Bessie E. Wilder describes a mathematical problem of the kind H. B. Newson was studying. Newson published a paper entitled "Unicursal Curves by Method of Inversion" in volume 1 of the *Kansas University Quarterly* in 1892; in his introduction, Newson stated that "this paper contains a summary of the work done during the last school year by my class in Modern Geometry. . . . Many of the results were contributed by Messrs. M. E. Rice, A. L. Candy, H. C. Riggs, and Miss Annie L. MacKinnon." Thus, Rice was in Newson's class in Modern Geometry during 1891-1892. This fact, the subjects studied by this class, and the title of Rice's thesis all suggest that he wrote his thesis during 1892-1893 on a topic suggested by Professor Newson and received a master's degree in mathematics in 1893.

Helen B. Brewster received an A.B. degree from the University in 1900 and an A.M. degree in mathematics in 1901. Bessie E. Wilder did not include her in the list of those who wrote theses [Wilder 1], but Helen Brewster is listed--with her two degrees--as a graduate fellow in mathematics in the University catalog for 1901-1902; she is also listed (with degrees) as a graduate student in mathematics, physics, and German in the catalog for 1902-1903. She is listed also, with degrees, in the Catalogue Number of *The Graduate Magazine* [*The Graduate Magazine* 2]. There is no record of her thesis, but it seems safe to assume that it was the paper entitled "On Collineations in Space which Leave Invariant a Quadric Surface", which she published in volume 1 of the *Kansas University Science Bulletin*. She married Frederick William Owens, who received a master's degree in 1902, and thus started a tradition of marriages between graduate students in mathematics which still exists today. Helen B. Brewster remained a prominent alumna of the University throughout a long life, and there are many references to her [Owens 1, 2, 3]. She received a Ph.D. degree from Cornell University in 1910 and published a paper in the *American Journal of Mathematics* soon afterward [Owens 2, 3]. Her glowing praise of Fred Ellsworth, which was included in the *Alumni Magazine*'s tribute [Ellsworth 3, pp. 6-7] to him, follows.

> So vivid is my recollection of our first meeting, it seems like yesterday. It was Commencement week at K. U.--1925. A bit embarrassed at breaking into your busy time--you, a young, complete stranger to both of us--we gave our names, and you sprang to your feet, stretched out your hand, and said, "But I have been waiting for you with greetings from my mother. She went to school to your mother when your mother was a very young teacher in Linn County."

Further information about Mrs. Owens can be obtained from the account of her husband which follows. I knew Professor and Mrs. Owens because they came to see me once or twice on their visits to Kansas and the University.

Frederick William Owens received a B.S. degree in engineering and an M.S. degree in mathematics, both in the year 1902. His master's thesis was entitled "On Some Physical Applications of Hamilton's Operator"; it is not clear which member of the staff supervised this thesis. During the year 1902-1903 he was a graduate fellow in mathematics in The University of Kansas. He received a Ph.D. degree in mathematics from the University of Chicago in 1907 and held important positions thereafter as indicated by his biography in *American Men of Science*, Sixth Edition (1938) [S, Appendix IX, Owens].

Fred Keplinger received a master's degree in 1904; his thesis, "Continuous Groups of Projective Transformations in Two Dimensions", clearly was written under the supervision of Professor Newson. The catalog for 1903-1904 lists Mr. Keplinger as a teaching fellow in mathematics, but nothing further is known about him.

James Abram Garfield Shirk received an M.S. degree from The University of Kansas in 1905. Although the record does not give the field in which his degree was awarded, and although there is no record of his thesis nor of its title (if he wrote one), the evidence seems conclusive that he received a master's degree in mathematics. Mr. Shirk was an assistant instructor in the Department of Mathematics from 1904 to 1906. Shirk's biography in *American Men of Science*, Eighth Edition (1949) [S, Appendix IX, Shirk] shows that he achieved a significant position in mathematics in Kansas.

Ulysses Grant Mitchell entered The University of Kansas in 1904 with a certificate which he had received in 1898 from Central Normal College [S, Appendix IV contains Mitchell's curriculum vitae and other information].

Mrs. Wilimina Everett Pitcher states that Professor Mitchell received an A.B. degree from the University at the end of the first half of 1905-1906 [S, Appendix II]. The catalogs state that U. G. Mitchell was a Fellow in Education during 1904-1905, an Assistant Instructor in American History during 1905-1906, and an Instructor in Mathematics during 1906-1907 and 1907-1908. Mr. Michtell maintained his three interests in mathematics, history, and education throughout the remainder of his life. Mr. Mitchell received an A.M. degree in mathematics from The University of Kansas in 1907; his thesis, entitled "Certain Continuous Groups of Projective Transformations Treated Analytically", clearly was written under the supervision of Professor Newson. Mr. Mitchell was absent on leave during 1908-1909 and 1909-1910 while he was a graduate student at Princeton University. He wrote his Ph.D. thesis there under Professor Oswald Veblen [Archibald 1, p. 209] and received his Ph.D. degree from Princeton in 1910. He rejoined the staff of the Department in 1910 and spent the remainder of his life as a member of the faculty of The University of Kansas (he was the Department's Chairman from 1931 to 1941).

Arthur Dunn Pitcher entered The University of Kansas in 1903 at the age of twenty-three; he completed the requirements for the A.B. degree at the end of the first half of 1905-1906. The catalogs list him as a Fellow in Mathematics during 1905-1906 and as an Instructor in Mathematics during 1906-1907 and 1907-1908. He received his A.M. degree in 1907; his thesis, entitled "An Analytical Determination of Certain Line Groups in the Plane", was supervised by Professor Newson. Pitcher was absent on leave during the two academic years 1908-1910; he received his Ph.D. degree from the University of Chicago in 1910 with a thesis on general analysis written under the supervision of E. H. Moore [Archibald 1, p. 146]. He rejoined the staff of the Department in 1910.

In 1910 Arthur Dunn Pitcher married Wilimina Everett; she had graduated with a major in mathematics in 1907 and taught high school mathematics in Abilene, Kansas during 1907-1908 and in the Lawrence High School from 1908 to 1910. Their son, Arthur Everett Pitcher, is Professor of Mathematics at Lehigh University and the Secretary of the American Mathematical Society. In 1971, as a result of my conversations with A. E. Pitcher, Mrs. Wilimina Everett Pitcher, his mother, wrote her reminiscences of the K. U. Department of Mathematics as she knew it during the period from 1903 to 1911 [S, Appendix II].

In 1898-1899 the staff of the Department of Mathematics and Astronomy consisted of Ephraim Miller, Henry Byron Newson, and Martin Everett Rice. At the end of that year, Rice left the Department and never returned. The enrollment of the University had increased under Chancellor Snow, and it increased even faster after Frank Strong became chancellor in 1902. Rice's departure was the beginning of many changes in the staff; as the following lists indicate, it marked the beginning of a period in which the staff was very unstable.

Staff of the Department of Mathematics and Astronomy

1899-1900

Ephraim Miller, A.B., 1855, A.M., 1858, Ph.D., 1895 (Allegheny)
Professor of Mathematics and Astronomy, 1875; 1874.
23 and 25 Fraser 1244 Tennessee Street
Henry Byron Newson, B.S., 1883, Ph.D., 1892 (Ohio Wesleyan)
Associate Professor of Mathematics, 1892; 1890.
24 Fraser 1702 Massachusetts Street
Arthur Sinclair Hull, Student Instructor in Physics and Mathematics
Alfred H. Parrott, Student Instructor in Mathematics

1900-1901

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Associate Professor of Mathematics
Arthur Sinclair Hull, A.B., 1900 (University of Kansas)
Instructor in Mathematics
24 Fraser 1208 Kentucky Street

1901-1902

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Associate Professor of Mathematics
John Nicholas Van der Vries, A.B., 1896, A.M., 1899 (Hope); Ph.D., 1901 (Clark).
Assistant Professor of Mathematics, 1901.
23 Fraser 1136 Louisiana Street
Helen B. Brewster, A.B., 1900, A.M., 1901 (University of Kansas)
Graduate Fellow in Mathematics, 1901.

Professor Van der Vries was appointed as an Assistant Professor of Mathematics in 1901. He was destined to play an important role in the Department (see his biography in the Fifth Edition, 1933, of *American Men of Science* [S, Appendix IX, Van der Vries]).

1902-1903

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Associate Professor of Mathematics
John Nicholas Van der Vries
Assistant Professor of Mathematics
Charles Hamilton Ashton, A.B., 1887 (Union); A.M., 1893 (Harvard)
Assistant Professor of Mathematics, 1903.
Frederick William Owens, B.S, M.S, 1902 (University of Kansas)
Graduate Fellow in Mathematics, 1902.

Although Professor Ashton's name appears in the catalog for 1902-1903, all of the evidence indicates that he did not join the faculty until 1903. Professor Van der Vries became chairman of the Department in 1911, and Professor Ashton followed him as chairman in 1918 [S, Appendix IX, Ashton].

In the spring of 1903 Frank Strong had been chancellor for a year; one of his concerns was Ephraim Miller's age. In April, Chancellor Strong proposed to Dean Miller that he resign so that a younger man could take over as Dean of the College of Liberal Arts and Sciences, and in August 1903, he forced Miller to resign. The following letter from Richard Cobb, chairman of the Harvard University Appointment Committee, dated July 7, 1903, shows that Chancellor Strong also was searching for a mathematician who could be appointed to the staff with the expectation that he would soon succeed Professor Miller as Chairman of the Department of Mathematics. Since Professor Newson was next in seniority after Professor Miller, this letter suggests that Chancellor Strong had already decided not to appoint Professor Newson to follow Professor Miller as chairman.

> Probably by now you have heard from Professor Byerly, and undoubtedly he has told you of Archie Burton Pierce. I do not know Mr. Pierce, but from all I have learned of him I gather that he is a distinctly capable man and personally he is probably more attractive than Mr. Ashton. The one difficulty I have always felt myself in recommending Mr. Ashton to anyone who could not actually meet him was his personality which, evident at first sight, would in many quarters tell much against him. Mr. Pierce has I believe more general presentability than Mr. Ashton will ever possess; and I am inclined to think that he is fully as good a Mathematician. Having taught a number of years in the University of California, he knows the West as well as the East, and he has got on well both in the West and the East. I feel that he is a strong man, but because I do not know him personally I have asked Professor Byerly to write to you of him, and of the other possibilities. When I last wrote to you I did not

understand that you might wish someone for the Head of the Department at once, but that you were merely looking forward to the future, and I felt it only right that you should know of Mr. Ashton's hopes which he had communicated to me. I can, of course readily perceive that you cannot put him into such a position at once, and I do not think that I should myself under any circumstances do so. I should wish first to see that he can so to speak, mix with the people about him. He is a man whom I believe in as a capable, honest, faithful worker.

Staff of the Department of Mathematics and Astronomy

1903-1904

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Associate Professor of Mathematics
John Nicholas Van der Vries
Assistant Professor of Mathematics
Charles Hamilton Ashton
Assistant Professor of Mathematics, 1903
24 Fraser 1240 Rhode Island Street
Fred Keplinger
Teaching Fellow in Mathematics, 1903

(The rank and title "Assistant Instructor" appear in the 1903-1904 catalog for the first time; p. 16 of this catalog contains a complete list of titles and ranks in the University.)

1904-1905

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Associate Professor of Mathematics
John Nicholas Van der Vries
Assistant Professor of Mathematics
Charles Hamilton Ashton
Assistant Professor of Mathematics
James Abram Garfield Shirk, A.B., 1901, A.M., 1902 (McPherson College)
Teaching Fellow in Mathematics, 1904.

Page 148 of the catalog for 1904-1905 contains a description of the Department's mathematical models (they were described first in the catalogs for 1884-1885 and 1885-1886). The same page of the catalog states that the University Library contains about 1000 volumes of mathematical works, and lists some of the principal sets of journals and other items. In addition, the catalog gives a description of the Department's telescopes and other astronomical equipment.

1905-1906

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson, B.S., 1883, Ph.D., 1892 (Ohio Wesleyan)
Professor of Mathematics, 1905; 1890.
John Nicholas Van der Vries
Assistant Professor of Mathematics
Charles Hamilton Ashton
Assistant Professor of Mathematics
James Abram Garfield Shirk, A.B., 1901, A.M., 1902 (McPherson College); M.S., 1905 (University of Kansas)
Assistant Instructor in Mathematics, 1905
Arthur Dunn Pitcher, A.B., 1906 (University of Kansas)
Fellow in Mathematics, 1905

In 1905, Professor Newson finally received a promotion to a Professorship; he had been an Associate Professor since 1892. The list of staff of the Department of Mathematics for 1905-1906 shows that Mr. James A. G. Shirk received a master's degree in 1905. Since he taught mathematics for two years, it is reasonable to assume that his master's degree was in mathematics. Bessie E. Wilder, however, did not list a thesis for him [Wilder 1]. The catalogue of graduates [*The Graduate Magazine* 2] verifies that Mr. Shirk received an M.S. degree in 1905, but does not give the subject. The only information that the Catalogue Number gives about Mr. Shirk's activities is the following:

> Shirk, James A.G., M.S. Teacher of Physics in State Manual Training Normal School of Kansas, 306 S. Walnut street, Pittsburg, Kan.

The absence of a complete record for Mr. Shirk illustrates the difficulties encountered in writing history. Professor Rice's master's degree supplies another illustration. Martin E. Rice received an M.S. degree in 1893, and although Bessie E. Wilder questioningly assigns his degree to physics, the evidence seems conclusive that he wrote a thesis on mathematics. Finally, although we know that Helen B. Brewster received a master's degree in 1901, there is no record of her thesis.

1906-1907

Ephraim Miller
  Professor of Mathematics and Astronomy
Henry Byron Newson
  Professor of Mathematics
John Nicholas Van der Vries
  Associate Professor of Mathematics
Charles Hamilton Ashton
  Assistant Professor of Mathematics
Arthur Dunn Pitcher, A.B., 1906, A.M., 1907 (University of Kansas)
  Instructor in Mathematics, 1906
  24 Fraser 945 Vermont Street
Ulysses Grant Mitchell, A.B., 1898 (Central Normal College), A.M., 1907 (University of Kansas)
  Instructor in Mathematics, 1906
  24 Fraser 1708 Massachusetts Street

This year (1906-1907) Van der Vries received a promotion to an Associate Professorship. Although they were crowded into two--or at most three--rooms, all members of the staff had their offices in Fraser Hall during 1906-1907.

1907-1908

Ephraim Miller, A.B., 1855, A.M., 1858, Ph.D., 1895 (Allegheny)
Professor of Mathematics and Astronomy, 1875; 1874
23 and 25 Fraser Hall 1244 Tennessee Street
Henry Byron Newson, B.S., 1883, Ph.D., 1892 (Ohio Wesleyan)
Professor of Mathematics, 1905; 1890
24 Fraser Hall 1702 Massachusetts Street
John Nicholas Van der Vries, A.B., 1896, A.M., 1899 (Hope); Ph.D., 1901 (Clark)
Associate Professor of Mathematics, 1906; 1901
23 Fraser Hall 832 Kentucky Street
Charles Hamilton Ashton, A.B., 1887 (Union); A.M., 1893 (Harvard)
Assistant Professor of Mathematics, 1903
24 Fraser Hall 1202 Ohio Street
Ulysses Grant Mitchell, A.B., 1898 (Central Normal College); A.M., 1907 (University of Kansas)
Instructor in Mathematics, 1906
24 Fraser Hall 1304 Vermont Street
Arthur Dunn Pitcher, A.B., 1906, A.M., 1907 (University of Kansas)
24 Fraser Hall 945 Vermont Street

1908-1909

Ephraim Miller
Professor of Mathematics and Astronomy
Henry Byron Newson
Professor of Mathematics
John Nicholas Van der Vries
Associate Professor of Mathematics
Charles Hamilton Ashton
Assistant Professor of Mathematics
Absent on leave in Munich, Germany during 1908-1909
George Wilber Hartwell, Ph.B., 1903 (Wesleyan); A.M., 1906 (Columbia)
Assistant Professor of Mathematics, 1908
24 Fraser Hall 1104 Tennessee Street
Arthur Dunn Pitcher
Instructor in Mathematics
Absent on leave at the University of Chicago during 1908-1909
Ulysses Grant Mitchell
Instructor in Mathematics
Absent on leave at Princeton University during 1908-1909

Meyer Gaba, B.S., 1907, M.S., 1908 (University of Chicago)
Instructor in Mathematics, 1908
23 Fraser Hall 1215 Ohio Street
Charles Arthur Pierce, A.B., 1907 (Indiana University)
Instructor in Mathematics, 1908
23 Fraser Hall 815 Indiana Street
Paul Wernicke, Ph.D., 1903 (Göttingen)
Instructor in Mathematics, 1908
23 Fraser Hall 907 Arkansas Street

The catalog states that George Wilber Hartwell [S, Appendix IX, Hartwell] was appointed for the year 1908-1909 only. He was undoubtedly a replacement for Professor Ashton, who was on leave in Munich, Germany seeking a Ph.D. degree.

1909-1910

Ephraim Miller, A.B., 1855, A.M., 1858, Ph.D., 1895 (Allegheny)
Professor of Mathematics and Astronomy, 1875; 1874
203 Fraser Hall 1224 Tennessee Street
Henry Byron Newson, B.S., 1883, Ph.D., 1892 (Ohio Wesleyan)
Professor of Mathematics, 1905; 1890
104 Blake 1702 Massachusetts Street
John Nicholas Van der Vries, A.B., 1896, A.M., 1899 (Hope); Ph.D., 1901 (Clark)
Associate Professor of Mathematics, 1906; 1901
108 General Engineering Building 832 Kentucky Street
Charles Hamilton Ashton, A.B., 1887 (Union); A.M., 1893 (Harvard); Ph.D., 1909 (Munich)
Assistant Professor of Mathematics, 1903
108 General Engineering Building 1202 Ohio Street
Meyer Gaba, B.S., 1907, M.S., 1908 (University of Chicago)
Instructor in Mathematics, 1908
108 General Engineering Building 1209 Ohio Street
Paul Wernicke, Ph.D., 1903 (Göttingen)
Instructor in Mathematics, 1908
203 Fraser Hall 907 Arkansas Street
Wilhelmina Bauer, A.B., 1905 (Washburn College)
Instructor in Mathematics, 1909
203 Fraser Hall 1108 Ohio Street
Arthur Bowes Frizell, A.B., 1893, A.M., 1900 (Harvard)
Instructor in Mathematics, 1909
108 General Engineering Building 1247 Kentucky Street

Arthur Dunn Pitcher
Instructor in Mathematics
Absent on leave at the University of Chicago during 1909-1910
Ulysses Grant Mitchell
Instructor in Mathematics
Absent on leave at Princeton University during 1909-1910
Robert S. Pond, A.B., 1899 (Washburn College); A.M., 1908 (Marietta College)
University Fellow in Mathematics, 1909

The annual lists of staff members of the Department of Mathematics and Astronomy given above supply a record of the instructors who taught the Department's courses, and in addition they provide the background for understanding some of the causes of serious difficulties that soon developed. Ephraim Miller was appointed to the faculty in 1874 and Henry Byron Newson was added in 1890; until 1910 these two provided the experience, continuity, wisdom, and stability which held the Department together and enabled it to make steady progress. The nature of the staff began to change in 1899: in that year Martin Everett Rice left the staff of the Department and his place was taken the following year by Arthur Sinclair Hull and Alfred H. Parrott, two student instructors. From that time on, graduate student assistants were regularly included in the staff of the Department, and the list of those who had served by 1910 includes also Helen B. Brewster, Frederick William Owens, Fred Keplinger, J. A. G. Shirk, Arthur Dunn Pitcher, Ulysses Grant Mitchell, Wilhelmina Bauer, Arthur Bowes Frizell, and Robert Spencer Pond. The staff contained still another group of young, inexperienced, and temporary instructors; they were junior mathematicians, usually without the Ph.D. degree, who served on the staff for periods of one to three years. This group includes George Wilber Hartwell, Meyer Gaba, Charles Arthur Pierce, and Paul Wernicke. (For staff biographies from *American Men of Science*, see Appendix IX.) Thus, expanding enrollments, accompanied by University budgets that did not keep pace, resulted in the development of a staff in the Department of Mathematics and Astronomy which was young, inexperienced, temporary, and unstable--a staff lacking in the devotion to a cause and an ideal that characterized the pioneers in the University. This situation had serious consequences for the Department when Ephraim Miller and H. B. Newson were suddenly removed from the University in 1910.

The catalogs covering the first decade of this century also illustrate the unsatisfactory office space that has been provided for mathematics throughout most of the history of the University. As late as 1908-1909 the entire staff of the Department of Mathematics and Astronomy was housed in rooms 23, 24, and 25 in Fraser Hall; 1909-1910 was the year of the great dispersion. The catalog for 1909-1910 states that Ephraim Miller, Paul Wernicke, and Wilhelmina Bauer had their offices in 203 Fraser Hall; that Henry Byron Newson had his office in 104 Blake Hall; and that John Nicholas Van der Vries, Charles H. Ashton, Meyer Gaba, and Arthur Bowes Frizell had their offices in 108 General Engineering Building (Marvin Hall). Only Newson had a private office. In addition, the three rooms into which the staff was crowded were located in three widely separated buildings. This situation was not conducive to high morale or to a sense of solidarity and common purpose.

An account has been given already of the formation of the Chicago Section of the American Mathematical Society in 1896 and of Professor Newson's participation in its activities. In 1906, the Southwestern Section of the American Mathematical Society was established and mathematicians at The University of Kansas were even more active in its affairs. Archibald's account of the Chicago Section [Archibald 1, p. 77] contains the following account of the establishment of the Southwestern Section:

> At the nineteenth meeting of the Section in Apr. 1906, when the 40 persons in attendance included 28 members of the Society, 25 papers were presented. A resolution introduced by Prof. Moore, and unanimously carried, expressed the very earnest hope of the Chicago Section that it may be possible to establish a strong section of the Society which shall hold meetings at some convenient center in the Southwest. This was transmitted to the Council with a supporting letter from Prof. Moore. On the basis of this, and representations made by Prof. Hedrick, the Council in Dec. 1906 authorized the formation of a Southwestern Section and approved of Profs. Hedrick, Chessin, and Porter as members of the program comm. Thus the Chicago group not only originated but developed the Section idea. A San Francisco Section was organized in 1902. . . .

Archibald completes his account of the Southwestern Section [Archibald 1, p. 9] as follows:

> The preliminary meeting of the proposed Southwestern Section of the AMS took place at Columbia, Mo. on 1 Dec. 1906. Among the thirty-five persons present were twenty members of the Society. Prof. E. R. Hedrick was elected chm. and Prof. A. S. Chessin secy. The Council authorized the formation of the Section at its annual meeting in 1906. Up to the end of 1928 twenty-one meetings of the Section had been held, and the ideals of the Society and interest in mathematics were appreciably promoted by them. The chairmen and secretaries of this Section were as follows:

Chairmen

A. S. Chessin 07-08
E. W. Davis 08-10, 13-14
W. H. Roever 10-11, 14-15, 27
J. N. Van der Vries 11-12,15-16
E. R. Hedrick 12-13,17-19,20-21,22-23
S. W. Reaves 16-17
W. C. Brenke 19-20, 26
C. H. Ashton 21-22
E. R. Smith 24
R. L. Moore 25
U.G. Mitchell 28

Secretaries

O. D. Kellogg 07-19   L. Ingold 20, 26   E. B. Stouffer 21-25, 27-28

> The principal leadership of the Southwestern Section came from the following universities: Washington University in St. Louis, the University of Missouri at Columbia, The University of Kansas, and the University of Nebraska.

An account has been given already of the University's first Ph.D. degree: in 1895 Arnold Emch received a Ph.D. degree in mathematics; his thesis, entitled "Projective Groups of Perspective Collineations in the Plane Treated Synthetically", was published in the *Kansas University Quarterly* in 1896. No further doctoral candidates earned degrees in mathematics until 1910, when Arthur Bowes Frizell and Robert Spencer Pond received Ph.D. degrees. Frizell's thesis, "Foundations of Arithmetic" and Pond's, "Collineations in Space of Four Dimensions", are on file in Watson Library. Apparently Frizell's thesis was entirely his own work since he does not acknowledge indebtedness to anyone for suggesting the subject of his dissertation or for supervising its preparation. The entire dissertation consists of thirty-six typed pages; there is no bibliography, but there is a short biography of the author at the end. The following are the two opening paragraphs of Frizell's dissertation, and his biography.

> This thesis seeks a foundation for arithmetic in the ideas underlying Cantor's formulation of his system of ordinal types.
>
> It proceeds by postulating, but follows D. Hilbert and G. Peano rather than E. V. Huntington. The search is for postulates possessing heuristic and didactic, not merely subsumptive value. . . .

> I, Arthur Bowes Frizell, member of the Protestant Episcopal Church, was born in Boston, July 14, 1865. My parents were Joseph Palmer Fessenden Frizell, civil and hydraulic engineer,

> and Julia Anna (Bowes) Frizell. My early education was chiefly at home and in a private school in Dorchester, Mass. I graduated from the High School in St. Paul, Minn. and spent three years at the Massachusetts Institute of Technology, where I afterwards served as assistant instructor in mathematics 1888-1891. I received the degree of Bachelor of Arts from Harvard College in 1893 and that of Master of Arts from Harvard University in 1900. I served as instructor in mathematics at New York University 1895-6 and at Harvard from 1897-1906 when I resigned to study abroad. After three semesters at Göttingen, I returned to America and was appointed, in 1908, Professor of Mathematics in Midland College, Atchison, which position I resigned, 1909, to accept an instructorship in the University of Kansas.

Emch, the Department's first Ph.D., was highly successful, winning a star in the First Edition (1906) of *American Men of Science*. Frizell, on the other hand, appears not to have been very successful (see his biography in *American Men of Science* [S, Appendix IX, Frizell]). He was forty-five years old when he received his Ph.D. degree. Although he studied at Massachusetts Institute of Technology, Harvard, and Göttingen, and although he held assistantships at M. I. T., Harvard, and New York University, it appears that he was unsuccessful as a student and as a mathematician, and that he never held a position of any significance. He tried, because the *Bulletin of the American Mathematical Society* contains records of papers which he presented at meetings of the AMS, but the reviews of his papers in *Jahrbuch über die Fortschritte der Mathematik*, indicate that Frizell's mathematics was lacking in depth and significance. Frizell's dissertation, as noted above and in the *Jahrbuch der Mathematik*, was published as "Foundations of Arithmetic", in the *Kansas University Science Bulletin*, vol. 5 (1910), pp. 381-411.

Robert S. Pond also received a Ph.D. degree in 1910. The title of his thesis and a reference indicate that it was written under the supervision of Professor Newson. Pond's dissertation was published as "Collineations in Space of Four Dimensions", in the *Kansas University Science Bulletin*, vol. 7 (1913), pp. 241-259. The biography of R. S. Pond in the Sixth Edition (1938) of *American Men of Science* [S, Appendix IX, Pond] supplies information about him. He was born in Elmira, New York in 1876; he received his A.B. degree from Washburn College in 1899. Younger than Frizell, Pond received his Ph.D. degree when he was thirty-four years old. He taught at the University of Georgia from 1910 to 1920, held a position in industry from 1920 to 1929, taught at Morris Harvey College in Charleston, West Virginia, from 1929 to 1931, and joined the faculty of Southwestern at Memphis in 1931 for the remainder of his career. Professor Pond assisted Professor Paul S. Mostert, a member of the staff of the K. U. Department of Mathematics, to enter Southwestern at Memphis as an undergraduate in 1946. Professor Pond was responsible for a good department of mathematics in one of the small liberal arts colleges in the South.

In addition to Frizell and Pond, who received their Ph.D. degrees from The University of Kansas, five of those who received master's degrees from The University of Kansas went on to receive Ph.D. degrees from other universities. Albert Luther Candy received an M.A. degree from K. U. in 1893 and a Ph.D. degree from the University of Nebraska in 1898; he was an important member of the faculty of the University of Nebraska from 1893 to 1935 and the Chairman of its Department of Mathematics from 1919 to 1934 (see his biography in the Sixth Edition (1938) of *American Men of Science* [S, Appendix IX, Candy]). Helen B. Brewster received a master's degree from The University of Kansas in 1901 and a Ph.D. degree from Cornell University in 1910; she is best known as Mrs. Frederick William Owens. Her husband, Frederick William Owens, received his master's degree from the Department in 1902 and his Ph.D. degree from the University of Chicago in 1907; his thesis was supervised by E. H. Moore [Archibald 1, p. 146]. Owens was a member of the faculty of Cornell University from 1907 to 1926 and head of the Department of Mathematics of Pennsylvania State University from 1926 to 1949 (see his biography from the Sixth Edition (1938) of *American Men of Science* [S, Appendix IX, Owens]).

Ulysses Grant Mitchell and Arthur Dunn Pitcher both received master's degrees from the Department in 1907, and both received Ph.D. degrees in 1910--Mitchell from Princeton University and Pitcher from the University of Chicago. Mitchell's thesis was written under the supervision of Oswald Veblen [Archibald 1, p.209] and what appears to be an abstract of it was published as follows.

> U.G. Mitchell, "Geometry and the Collineation Groups of the Finite Projective Plane PG(2, $2^2$)", *Bulletin of the American Mathematical Society* (2), vol. 17 (1910-1911), pp. 521-522.

Pitcher's thesis was written under the supervision of E. H. Moore [Archibald 1, p. 146], and it was published as follows.

> Arthur Dunn Pitcher, "The Interrelation of the Eight Fundamental Properties of the Classes of Functions", *Kansas University Science Bulletin*, vol. 7 (1913), pp. 1-67.

Both Mitchell and Pitcher joined the staff of the Department of Mathematics in 1910; Mitchell remained on the Department's staff until his death on January 1, 1942, but Pitcher accepted a position at Dartmouth College after only one year at The University of Kansas (for biographies from *American*

*Men of Science*, see [S, Appendix IX, Mitchell and Pitcher]). Professor Mitchell continued his three interests--history, education, and mathematics--by studying the history of mathematics, by collecting early books on mathematics, by training teachers of mathematics, and by teaching mathematics. He was a teacher rather than a research mathematician; he served as the Chairman of the Department from 1931 to 1941.

Mathematics Staff, 1890-1910

| | |
|---|---|
| Ephraim Miller | 1874-1910 |
| Henry Byron Newson | 1890-1910 |
| Martin Everett Rice | 1892-1899 |
| Arthur Sinclair Hull | 1899-1901 |
| Alfred H. Parrott | 1899-1900 |
| John Nicholas Van der Vries | 1901-1918 |
| Charles Hamilton Ashton[1] | 1903-1936 |
| Fred Keplinger | 1903-1904 |
| James Abrams Garfield Shirk | 1904-1906 |
| Ulysses Grant Mitchell[2] | 1906-1942 |
| Arthur Dunn Pitcher[3] | 1906-1911 |
| George Wilber Hartwell | 1908-1909 |
| Meyer Grupp Gaba | 1908-1910 |
| Charles Arthur Pierce | 1908-1909 |
| Paul Wernicke | 1908-1910 |
| Wilhelmina Bauer | 1909-1910 |
| Arthur Bowes Frizell | 1909-1912 |

1. On leave in Munich, Germany during 1908-1909.
2. On leave at Princeton University during 1908-1910.
3. On leave at the University of Chicago during 1908-1910.

This chapter has treated the period from 1890 to 1910. The period opened with the inauguration of Francis Huntington Snow as chancellor, with a great surge of activity in research and publication, with the establishment of chapters of Phi Beta Kappa and Sigma Xi, and with the arrival of Henry Byron Newson in the Department of Mathematics. The period was one of the most illustrious in the history of the University; it was also the period in which the Department of Mathematics reached maturity through the addition of research to its program of teaching, and in which the Department achieved a position of national prominence. Two people--Ephraim Miller and Henry Byron Newson--are entitled to essentially all of the credit for the Department's accomplishments and national prominence; they were the first to influence the development of mathematics in the University, and Van der Vries and Ashton (both teachers only!) joined the staff only in 1901 and 1903 respectively. As the period came to an end in 1910 the Department suffered a severe blow, for it lost its two leaders--Newson through death and Miller through retirement. Thus, it is appropriate to end this account of the period from 1890 to 1910 with an evaluation of the contributions of Newson and Miller.

Let us begin with Newson. His complete bibliography follows; it will form a useful background for discussing his contributions.

Bibliography of Henry Byron Newson

1. "On the Eccentricity of Plane Sections of Quadrics." *Annals of Mathematics*, vol. 5, pp. 1-9, 1889.

2. "The Imaginary Focal Properties of Conic Sections." *Transactions of the Kansas Academy of Science*, vol. 12, pp. 84-87, 1890.

3. "On Salmon's and MacCullaugh's Methods of Generating Quadric Surfaces." *Annals of Mathematics*, vol. 6, pp. 198-200, 1891.

4. "A Pair of Curves of the Fourth Degree and their Application in the Theory of Quadrics." *American Journal of Mathematics*, vol. 14, pp. 87-95, 1892.

5. "Unicursal Curves by Method of Inversion." *Kansas University Quarterly*, vol. 1, pp. 47-71, 1892.

6. "The Linear Geometry of the Cubic and Quartic." *Kansas University Quarterly*, vol. 2, pp. 85-95, 1893.

7. "On the Hessian, Steinerian, Jacobian, etc., in the Geometry of One Dimension." *Kansas University Quarterly*, vol. 3, pp. 103-116, 1894.

8. "Continuous Groups of Projective Transformations Treated Synthetically, part I." *Kansas University Quarterly*, vol. 4, pp. 71-93, 1895.

9. "Supplementary Note on Continuous Groups of Projective Transformations Treated Synthetically." *Kansas University Quarterly*, vol. 4, pp. 169-171, 1895.

10. "On a Remarkable Covariant of a System of Quantics." *Bulletin of the American Mathematical Society* (2), vol. 2, pp. 272-276, 1896.

11. "Continuous Groups of Projective Transformations Treated Synthetically, part II." *Kansas University Quarterly*, vol. 4, pp. 243-249, 1896.

12. "On Hessians and Steinerians of Higher Orders in Geometry of One Dimension." *Annals of Mathematics*, vol. 11, pp. 121-129, 1897.

13. "Continuous Groups of Projective Transformations Treated Synthetically, part III." *Kansas University Quarterly*, vol. 5, pp. 81-98, 1897.

14. "Types of Projective Transformations in the Plane and in Space." *Kansas University Quarterly*, vol. 6, A, pp. 63-70, 1897.

15. "Continuous Groups of Circular Transformations." *Bulletin of the American Mathematical Society* (2), vol. 4, pp. 107-131, 1897.

16. "Normal Forms of Projective Transformations in the Plane and Space." *Kansas University Quarterly*, vol. 7, A, pp. 125-142, 1898.

17. "The Five Types of Projective Transformations in the Plane." *Kansas University Quarterly*, vol. 7, A, pp. 43-66, 1899.

18. "On the Construction of Collineations." *Kansas University Quarterly*, vol. 9, A, pp. 65-72, 1900.

19. "On the Volume of a Polyhedron." *Annals of Mathematics* (2), vol. 1, pp. 108-111, 1900.

20. "On Singular Transformations in Real Projective Groups." *Bulletin of the American Mathematical Society* (2), vol. 6, pp. 431-439, 1900.

21. "On Indirect Circular Transformations and Mixed Groups." *Bulletin of the American Mathematical Society* (2), vol. 7, pp. 259-266, 1901.

22. "On the Group of 216 Collineations in the Plane." *Kansas University Quarterly*, vol. 10, A, pp. 13-32, 1901.

23. "On the Group and Subgroups of Real Collineations Leaving a Tetrahedron Invariant (A New Theory of Collineations in Space, I)." *Kansas University Quarterly*, vol. 10, A, pp. 33-47, 1901.

24. "A New Theory of Collineations in Space, II." *Kansas University Quarterly*, vol. 10, A, pp. 87-99, 1901.

25. "A New Theory of Collineations in Space, III." *Kansas University Quarterly*, vol. 10, A, pp. 99-106, 1901.

26. "Note on the Product of Linear Substitutions." *Annals of Mathematics* (2), vol. 3, pp. 147-148, 1901.

27. "A New Theory of Collineations and their Lie Groups." *American Journal of Mathematics*, vol. 24, pp. 109-172, 1902.

28. "Report on the Theory of Collineations." *Proceedings of the American Association for the Advancement of Science*, vol. 51, pp. 579-599, 1902.

29. "Projective Transformations in One Dimension and their Continuous Groups." *Kansas University Science Bulletin*, vol. 1, pp. 115-142, 1902.

30. "On the Generation of Finite from Infinitesimal Tranformations.--A Correction." *Bulletin of the American Mathematical Society* (2), vol. 10, pp. 191-193, 1904.

31. *Graphic Algebra for Secondary Schools*. Boston: Ginn, 1905. iii + 19 pages.

32. "Trasformazioni Proiettive ad un Parametro e loro Gruppi Continui." *Giornale di Matematiche di Battaglini per il Progresso degli Studi nelle Università Italiane*, vol. 43, pp. 33-62, 1905.

33. "Copia di una Lettora al Prof. U. Amaldi." *Giornale di Matematiche di Battaglini per il Progresso degli Studi nelle Università Italiane*, vol. 45, pp. 93-94, 1907.

34. "Types and Continuous Groups of Real Conformal Transformations in $S_3$." *Giornale di Matematiche di Battaglini per il Progresso degli Studi nelle Università Italiane*, vol. 45, pp. 95-119, 1907.

35. "Theory of Collineations." *Kansas University Science Bulletin*, vol. 6, no. 1, x + 319 pages, 1911. (Photograph of author.)

Newson's "Report on the Theory of Collineations" (item 28 in his bibliography) was an invited address, read on July 2, 1902 before Section A of the American Association for the Advancement of Science at its Pittsburgh, Pennsylvania meeting. The invitation to give this address indicates that Newson was recognized nationally as a leader in his field of research. His report traces the history of the theory of collineations, outlines the current state of the theory, and describes the current research on it being done in American universities. Newson's report also discloses much about himself. For one thing, he was a good writer. For another, he had heard the call of destiny and had responded by committing himself to the life of the mathematician, and, in particular, to the study of the theory of collineations. The concluding section of his "Report on the Theory of Collineations" (pp. 598-599) follows:

> I have thus sketched for you in broad outlines a comprehensive theory of collineations and their Lie groups. To fill in all of the details is impossible, for such a task would expand this report of an hour into an extensive course of lectures running through one or more semesters of the usual college year. The march of the theory is along a highway as broad and straight as the traditional theological one "which leadeth to destruction"; but with this difference that few there be that walk therein, at least for the present. So straight and level is the path that the end can be seen almost from the beginning. There are few pitfalls or stumbling blocks in the way, and no roaring lions seeking whom they may devour.
>
> The theory is complete in outlines, but many of the details have not yet been worked out. While much has been done much still remains to do. A large share of my own mathematical endeavor has been spent in laying the foundation and rearing the walls of the superstructure. It is a self-imposed task, but one which I cannot rid myself of, if I would. However inviting other fields of mathematical study may be, I cannot desert my own. To this end was I born, so it seems, and for this came I into the world that a geometrical theory of collineations might be established and made so simple that it can be understood by Hilbert's "man on the street".
>
> To accomplish such a task is well-nigh impossible, but to strive for it earnestly is possible to every man who has tasted of the scientific spirit and thus come to know that the striving is its own reward and that the measure of success or failure attained thereby is merely a by-product of the process.

(The entire preface of Newson's *Theory of Collineations* [item 35 in his bibliography] is reprinted in chapter 2, section 4 of the Supplemental Volume as a summary of his mathematical research. The historical account of the theory of collineations in this preface is taken almost verbatim from his "Report on the Theory of Collineations".)

Newson made important contributions to the development of mathematics at The University of Kansas first of all through his establishment of research in the Department. In a short life (he was only forty-nine years old when he died), twenty years of which were spent at The University of Kansas, he published thirty-five papers and books. He was the first member of the faculty of the University to conduct research in mathematics (see [Newson, H. B. 6, 7]). He achieved a high position among the mathematicians of the United States as indicated by the "star" he received in the First Edition (1906) of *American Men of Science*, by his election as chairman of one meeting of the Chicago Section of the American Mathematical Society, and by the invitation to give his "Report on the Theory of Collineations" at the Pittsburgh meeting of the American Association for the Advancement of Science. His elections to membership in the Circolo Matematico di Palermo and the Deutsche Mathematiker Vereinigung indicate that he was known internationally. Nevertheless, an appraisal today of Newson's work indicates that his efforts did not make any lasting contributions to mathematics itself. He created no new theories, and to old theories he added no theorems that bear his name. Newson's papers were received without enthusiasm in Europe at the time of their publication. The *Jahrbuch über die Fortschritte der Mathematik*, in its reveiw of Newson's paper entitled "Projective Transformations in One Dimension and their Continuous Groups" (item 29 in his bibliography) states the following:

> Neue Resultate wird dabei niemand erwarten, aber auch die benutzte Methode kann auf Neuheit keinen Ausspruch machen, nicht einmal auf Eleganz.

Also, the *Jahrbuch der Mathematik*, in its review of Newson's paper entitled "Types and Continuous Groups of Real Conformal Transformations in $S_3$" (item 34 in his bibliography), states that

> Der Verf. dehnt seine früheren Untersuchungen (F. d. M. 34, 722, 1903 und 36, 733, 1905, die Zweite dieser Arbeiten ist übrigens nur eine Ubersetzung der ersten) aus auf die reellen konformen Transformationen des $R_3$.

The two papers referred to above are items 29 and 32 in Newson's bibliography. Finally, the complete review of Newson's *magnum opus*, his "Theory of Collineations", follows.

> Elementare, zusammenfassende Darstellung der projectiven Gruppe in der Ebene und ihrer Untergruppen, die zur Einführung in den Gegenstand sehr wohl geeignet ist. Geometrische und analytische Methoden wechseln ab, zahlreiche Übungsaufgaben am Schluss jedes Kapitels regen zu weiterer Beschäftigung mit dem Gegenstande an. Der Verf., der durch die Lieschen Vorlesungen in Leipzig (1887-1888) zur Gruppentheorie geführt wurde, hat dieses seine Lebensarbeit krönende Werk noch selbst zum Abschluss bringen, seine Drucklegung aber nur noch zum Teil überwachen können. Nach seinen Tode (17. Februar 1910) haben P. Wernicke und G. Mitchell die Sorge für die Herausgabe übernommen.

Newson was, however, largely responsible for the position of national prominence achieved by the Department of Mathematics and Astronomy. He published papers, attended national meetings and read papers at many of them, he participated in the organization of the Chicago Section of the American Mathematical Society, gave an invited address on his field of research, and wrote a monograph on the theory of collineations. All of these activities called attention not only to Newson himself but also to The University of Kansas. Chancellor Snow recognized the excellence of his Department of Mathematics and its national prominence when he wrote to a prospective student, "We have a very strong department of Mathematics in this University and you will find no better facilities in the United States for advanced mathematical study than can be found here." Ephraim Miller laid the foundations of this Department, but H. B. Newson erected the superstructure.

In addition, Newson made important contributions through his work with students. He was a stimulating teacher [Newson, H. B. 7]. Very quickly after he joined the staff of the Department he engaged his students in research, and at least his graduate students participated in his own research. In his paper entitled "Unicursal Curves by Method of Inversion" (item 5 in his bibliography) Newson wrote: "This paper contains a summary of the work done during the last school year by my class in Modern Geometry." Newson, in describing current research on collineations in his "Report on the Theory of Collineations" (item 28 in his bibliography) stated that "at the University of Kansas the writer and some of his pupils have been engaged in developing the theory of collineations outlined in the above pages". Also, the same report contains the following paragraph.

> Miss Helen Brewster has undertaken a detailed study of the group of collineations leaving invariant a surface of the second order. This group was carefully investigated by Lie in his "Theorie der Transformationsgruppen", Band III. On pages 251-4 he gives a table of twenty-four subgroups

> of the group $G_6(F)$. Miss Brewster has classified Lie's list according to the six types which enter into the group $G_6(F)$. She has also determined the structure of each subgroup, and indicated certain ones that contain singular transformations. This paper will also be presented at the Evanston meeting.

Helen B. Brewster published the research described here by Newson in a paper entitled "On Collineations in Space which Leave Invariant a Quadric Surface" in volume 1 (1902) of the *Kansas University Science Bulletin*. Newson appears to have been ahead of his time in involving his students in his own research. Professor Paul A. Smith, who received his master's degree from The University of Kansas in 1923, was the speaker at the Department's Honors Dinner in the spring of 1970. In his talk he commented that, when he was a graduate student, professors did not teach courses in the subjects of their own research nor engage students in their own research seminars. In 1970 graduate students were regularly involved in their professor's researches, and Professor Smith felt that this change represented a significant improvement over the 1920-1925 period. Apparently Professor Newson was exceptional, but his graduate students regularly participated in his research from 1895 to 1910. During the period from 1890 to 1910 Candy, Rice, Brewster, Owens, Keplinger, Shirk, Mitchell, and Pitcher received master's degrees, and Newson supervised most of their theses. During the same period Emch, Frizell, and Pond received Ph.D. degrees, and Newson supervised the theses of Emch and Pond, both of which dealt with problems in Newson's field of research.

A final measure of Newson's contributions was the success of the Department's students in obtaining Ph.D. degrees from leading departments of mathematics in other universities: A. L. Candy received his Ph.D. degree from the University of Nebraska; Helen B. Brewster received her Ph.D. degree from Cornell University;

F. W. Owens and A. D. Pitcher received their Ph.D. degrees from the University of Chicago; and U. G. Mitchell received his Ph.D. degree from Princeton University. These Ph.D. degrees awarded by other universities are an indication that the Department had a sound program under the leadership of Ephraim Miller and Henry Byron Newson; the Department's students were not always so successful at other universities in later years.

Newson made still other contributions to the Department and to the University. First, he strengthened the courses offered by the Department. For example, the catalogs list Newson as the instructor for the following advanced courses:

Modern Analytic and Synthetic Geometry of Two Dimensions
Modern Analytic and Synthetic Geometry of Three Dimensions
Differential Equations and their Applications to Geometry and Physics
Modern Geometry
Theory of Elliptic Functions
Theory of Curves and Surfaces
Theory of Functions of Real Variables
Theory of Substitutions
Spherical Harmonics

It is clear that Newson shouldered his share of the chores. For example, he was a member of the Committeee on Publication of the *Kansas University Quarterly* beginning with volume 8 (1899), and a card in the catalog of Watson Library states that he was managing editor from April to October 1901.

For all of these reasons, it is clear that Henry Byron Newson was one of the giants of the University's first half-century. He quickly received recognition nationally; it is not easy to explain why his recognition in the University came so slowly, especially after Chancellor Snow's high praise of the Department. Newson was appointed "Assistant in Mathematics" in 1890 and promoted to Associate Professor in 1892, but not until 1905 was he promoted to Professor. One wonders whether his 1902 statement that "the striving is its own reward" was based on disappointment and resignation.

Published records differ on the exact date of Newson's death. Some accounts state that he died on Thursday, February 17, 1910, but others, published at the time, state that he died on Friday, February 18, 1910. His wife's statement that he died "on the night of (Thursday) February 17, 1910" does not settle the matter. Under these circumstances, a letter written by Caroline Newson Beshers to a University librarian must be taken as the final authority. The letter, which gives a biographical sketch of Newson, is now in a faculty scrapbook in the University archives in Spencer Research Library.

2914 Kanawha St., N.W.
Washington 15, D.C.
June 2, 1951

Dear Miss Smelser,

Here is the picture of my father which I promised you so long ago. He was born July 10, 1860 and died February 17, 1910, as you remember. The 1909 Who's Who gives a biographical sketch. It does not mention, I think, that his money ran out before he got his Ph.D. and he had to cable his family from Germany to send him enough to come home. He probably never had very much in the first place. The three years of study, at Johns Hopkins where he studied chemistry, and at Heidelberg and Leipzig, represented long and patient saving from his years of teaching in various out-of-the-way places. He was teaching in Louisiana when he went to Germany--in a colored school, I think. At any rate he would only have received a pittance.

My father's most dominant characteristic I think was his dry wit, and his determination to seem a somewhat cynical character. Actually he was the kindest of men, looking after his mother and sisters as well as his wife and children and all on a most meager income. His deep love of literature, especially of poetry, is noteworthy too in a man of science. His last book, a Theory of Collinations, foreshadowed some of the modern discoveries, but I am not able to say to what extent he anticipated Einstein, though I have heard that suggested. . . .

Before evaluating the accomplishments of Ephraim Miller, a noteworthy accomplishment of Chancellor Strong should be recorded. *The Graduate Magazine* announced in a note in its January 1909 number that The University of Kansas had been elected to membership in the Association of American Universities [Strong 2]. Fred Ellsworth has described this important event [Ellsworth 1, part III].

> One of the greatest blows Strong struck for national and international prestige for the University of Kansas was by means of a hard-hitting talk before a national meeting of university presidents about 1908 or 1909. A Kansas graduate studying in Germany had been denied an advanced degree at a university over there. They found that his University was not a member of the Association of American Universities. That organization was a group of fewer than three dozen American universities whose graduate work, library facilities, and the like met certain standards.
>
> Dr. Strong let them know in no uncertain terms that the University of Kansas had a faculty and library fully up to required standards. Kansas was admitted to this elite group in less than a year after that. The organization still has only slightly more than 40 members. Membership in it is one of the most precious possessions of the University of Kansas.

The following bibliography of Ephraim Miller will form a useful background for a discussion of his contributions to the University and to the Department of Mathematics and Astronomy.

## Bibliography of Ephraim Miller

1. *A Treatise on Plane and Spherical Trigonometry*. Boston and New York: Leach, Shewell & Sanborn, 1891. vi + 114 pages. A third edition, with 79 pages, was published in 1894.

2. "Modern Higher Algebra, Determinants." *Kansas University Quarterly*, vol. 1, pp. 133-136, 1893.

3. "Differentials of the Second and Higher Orders." *Transactions of the Kansas Academy of Science*, vol. xii, pp. 65-67, 1889-1890.

4. "The Periods of Rotation of Mercury and Venus, and the Satellites of the Solar System." *Transactions of the Kansas Academy of Science*, vol. xiv, pp. 94-97, 1893-1894.

5. "A New Theory of the Surface Markings of the Moon." *Transactions of the Kansas Academy of Science*, vol. xv, pp. 10-13, 1895-1896.

6. "A New Theory of the Surface markings of the Moon." *Popular Astronomy*, vol. 4, pp. 273-278, 1896.

7. "Where Did Mars Get Its Moons?" *Transactions of the Kansas Academy of Science*, vol. xv, pp. 46-50, 1895-1896.

8. "Where Did Mars Get Its Moons?" *Popular Astronomy*, vol. 4, pp. 499-502, 1896.

9. "The Corona of the Sun." *Popular Astronomy*, vol. 8, pp. 80-86, 1900.

10. "The Corona of the Sun." *Transactions of the Kansas Academy of Science*, vol. xvii, pp. 210-214, 1899-1900.

11. "Science and the Nineteenth Century (Presidential Address)." *Transactions of the Kansas Academy of Science*, vol. xviii, pp. 26-35, 1901-1902.

12. "The Non-Euclidean Geometry." *Transactions of the Kansas Academy of Science*, vol. xix, pp. 274-278, 1903-1904.

13. "Variations of Latitude." *Transactions of the Kansas Academy of Science*, vol. xx, Part I, pp. 199-204, 1905.

14. "Francis Huntington Snow, Scientist." *Transactions of the Kansas Academy of Science*, vol. xxii, pp. 19-34, 1908.

Ephraim Miller was teacher, Professor of Mathematics and Astronomy, Chairman of the Department, University Librarian, Dean of the School of Arts, and University Marshal--but above all he was a teacher.

Ephraim Miller received his education before advanced mathematics was taught in this country and before graduate work and research in mathematics had developed in the United States. Furthermore, he was a high school teacher, principal, and superintendent for nineteen years after he graduated from Allegheny College. Nevertheless, Miller had an appreciation for advanced mathematics and research and promoted the development of a strong mathematics program in the University. In 1880 Miller closed his report to the Board of Regents thus:

> During the year that has just closed, your honorable body has seen fit to allow two terms of electives in mathematics. I hope the time is not far distant when this important and most exact of all the sciences will be carried to its utmost reach in the University of Kansas, that Quaternions, Trilinear Coordinates, the Method of Least Squares, Geometry of Three Dimensions, the Theory of Probabilities, etc., may meet that proper encouragement which their transcendent importance merits.

It was Ephraim Miller who laid the foundations for a strong Department of Mathematics, and on these foundations Henry Byron Newson was able to raise the superstructure of graduate work and research. Ephraim Miller was the University's senior mathematician from 1874 to 1910, and throughout this long period he provided the stability and leadership which enabled the Department to flourish.

Ephraim Miller was Librarian of the University from January 1, 1875 to April 1, 1887. In this position also he provided vigorous leadership. His reports to the Board of Regents are forthright in demanding more funds for purchasing books, hiring a full-time librarian, and providing adequate library space. Miller also prepared the first catalog of the library. (A more detailed account of Miller's services as Librarian will be given in chapter 6.)

Ephraim Miller was the second Dean of the School of Arts; he succeeded

Professor D. H. Robinson and served from 1895 to 1903, when Chancellor Strong forced Miller's resignation. Miller is remembered as dean for his kindly and sympathetic treatment of students [Miller 10; see especially "He Understood Students' Problems", by Ethel M. Giles].

Olin Templin was Ephraim Miller's student and protegé, and Miller played an important role in his development. Templin received the Cockins Prize in freshman mathematics in 1883, he received a bachelor's degree in 1886, and he was an "Assistant in Mathematics" from 1886 to 1890 (although on leave in Europe during 1888-1889). Furthermore, in 1889, Olin Templin received the first master's degree awarded by the Department of Mathematics; the work for this degree was supervised by Miller, since Newson had not yet arrived in the University. Although Templin became Associate Professor of Philosophy in 1890, he was not forgotten by Miller; Miller recommended Templin to Frank Strong as his successor as Dean of the School of Arts. On September 2, 1903, Chancellor Strong wrote to Thomas M. Potter, a regent:

> I have given the matter of Professor Miller's successor very careful consideration, and have consulted with graduates and teachers of the University whose judgment would be of most worth, and I believe that Professor Olin Templin is best adapted to undertake this very important work. One thing that weighed strongly also, was that Professor Miller was in favor of him.

It should be recalled also at this time that Ephraim Miller taught William Herbert Carruth and J. W. (Willis) Gleed in the Lawrence High School [Hyder 1, pp. 173-174].

Newspaper clippings in the Spencer Research Library state that Ephraim Miller was marshal of the faculty for thirteen years, but no record has been found which describes his duties, responsibilities, or service in this position.

Above all, Ephraim Miller was a teacher--the best loved teacher in the history of the University. His reports to the Board of Regents emphasize that he taught a large number of subjects and also large classes of students. When Bardwell died in 1878, Miller was asked to take charge of engineering temporarily. He taught arithmetic, algebra, and geometry in the Preparatory Department; he taught the full range of unversity-level courses in mathematics and astronomy; and he taught freshman, sophomore, and junior courses in history and in English literature. His 1876 report to the Board of Regents states, "I hear twenty-four recitations per week", and this report and others emphasize that some of his classes were very large. But neither the range of subjects nor the size of classes made his reputation; only his character and the stimulation and inspiration he imparted to his students account for the affection in which Ephraim Miller was held as a teacher. Miller's 1884 report to the Board of Regents (given in full in chapter 1) emphasizes his high ideals as a teacher and his deep understanding of the characteristics of the master teacher. The final paragraph of this report contains a forthright statement of Miller's devotion and commitment to his work as a teacher in the University: "Finally, gentlemen, whatever of power, whatever of skill, whatever of ability and enthusiasm I may possess, it is my determination, as in the past, to project these into all my work so long as my connection with the University shall continue."

These passages emphasize the high standards, the idealism, and the devotion with which Miller undertook his teaching. The affection of his students and the tributes they paid him are proof that his performance matched his high ideals. Tributes to Ephraim Miller were numerous and spontaneous. The following one, which appeared in a newspaper clipping dated April 25, 1908, comes from the Ephraim Miller Scrapbook in Spencer Research Library; both the newspaper and the author--a former student of Miller's--are unknown.

> Dr. E. Miller of the University of Kansas, had a birthday today. It makes no difference what particular birthday it was, for he pays no heed to the passing years, and is as young today as he was when he entered upon his life work more than a third of a century ago. He was born in Ohio, and when he had completed his education and taught school for a while, he came west, and in 1869 began work in the public schools of Lawrence. This work he continued for five years, until in 1874 he was given a place in the University. That place he has not only filled since that time, but he has builded the department steadily year by year, and the infant of his early care has grown under his supervision to be one of the greatest and best and strongest departments of its kind in any institution of learning in the world. And to Dr. Miller belongs the credit of it all.
>
> For more than a third of a century he has remained at his post of duty, working, thinking, helping always kindly of heart, always ready and willing to aid his boys and girls, and giving to them the best that there has been to give in his great heart and soul and brain. Hundreds, aye thousands of men and women have gone from the University of Kansas with feelings in their hearts akin to reverence for the grand good man who was a father to them. Once a man whose name is known on two continents for his achievements said to the writer of this: "I owe all my success, all that I am, and all that I can ever hope to be to our old and beloved teacher, Dr. Miller." And there are hundreds of others who think and feel the same as this man.
>
> It has been thirty years since the writer of this entered the state University, and his first instructor was Dr. Miller. The impressions gained of him that day have endured all these years. He was a friend when the boy needed a friend; he was kindly and helpful not only in school, but out of it. The advice he gave and the kindly spirit he manifested have never been forgotten. The writer knows that there are hundreds of others who have the same respect, admiration and love for their former teacher that he feels.
>
> And no teacher ever more fully earned the honor and love. The gentle kindly man is in the mind always of every student who has gone from old K. U., and each and every one has for him and of him only the best wishes and the fondest recollections.

He has done a great work, not only for the institution he has served so well, but for the young men and women who have learned from him, not only sciences he taught, but the lesson of true manhood and womanhood. All the world over he is an authority on the branches of science he teaches, but far better than that he has been a model for each and every student who has been fortunate enough to sit at his feet. That he may be spared yet many years to continue the good work he has been doing so long and so well is the earnest wish of every one who knows him.

The following tribute, written shortly after Miller's death by an unknown author, was published December 4, 1930, in the *Douglas County Republican* [Miller 15].

There died out in California the other day a man who had lived for almost a hundred years, and during that time he had been busy every day and hour, filling a long, rich and useful life with labor that made the world richer and men and women better. He was Ephraim Miller, one time a leader of education in Kansas, for many, many years a professor in Kansas State University, a mathematician of great renown, a student of astronomy who was known the world over. But it was not the great men whom he knew and helped in the work of exploring the heavens, not the great savants and the profound scholars of the world who loved him most, but the boys and girls of Kansas and the west who sat in his room and gained wisdom from his gentle lips and great heart and mind. The first class in which I was when a young student at Kansas State University was his, and that day he was so kindly, so fatherly, so charitable, that the fear and trembling that is the part of every student when he comes to his first day in college dropped away from me, and from that day for more than fifty years I have loved the man, as I think everyone of the thousands of his boys and girls loved him. Whenever I have gone to California, a part of the pleasure of the trip has been to visit the sainted old man. At ninety-five years, when I saw him last, he was as happy, as cheerful, as full of love for God and man as he was fifty years before, and the years had ripened and mellowed his already gentle nature until it seemed to me that he was more saint than man. The last words he said to me as I told him good bye at his door were, "I am going soon, and shall welcome the day, for my work is done." Then with one of the comical

> grimaces with which his students were so familiar he added, "But when I get Over There I do not want to put on golden slippers and loaf around on golden streets. I want them to give me a pair of wings, and when they do I shall soar far off into Infinity and shall discover and know the mighty works of God that in this world I have not been able to understand even in the smallest degree." And I have faith to believe that my old friend has already taken his wings and made the Great Discovery that he so longed for here on earth.

In those days there were heroes on university faculties, and Ephraim Miller was one of them.

In 1909 The University of Kansas had no plan or standard procedure for the retirement of elderly faculty members, and the University made no provision for a retirement income. A faculty member taught as long as he could; then he resigned and went away. The Carnegie Foundation for the Advancement of Teaching, however, had established Carnegie pensions which provided retirement incomes for many teachers throughout the nation. A clipping from an unknown newspaper, dated December 28, 1909, in the Spencer Research Library contains an announcement that Professor Miller planned to retire at the end of the 1909-1910 academic year and explains the circumstances as follows.

> Last winter the legislature authorized the members of the faculty of the state schools to avail themselves of the pensions as soon as they are eligible to receive them. The terms of the pension grants are that any teacher who has taught twenty-five years in an institution can receive a pension. At the time there were several faculty members at the university who were eligible under the requirements, but Professor Miller is the first to make known his intention to retire.

After the arrival of Henry Byron Newson, Professor Miller devoted his attention more and more to astronomy as indicated by the 1891 change in his title to Professor of Mathematics and Astronomy; his bibliography confirms an active and continuing interest in astronomy. Miller's most ambitious undertaking in astronomy was the effort (described earlier) to view the corona of the sun. His experiments extended over a period of three months in the spring and summer of 1899, and on one brief occasion he claimed success. Items 9 and 10 in his bibliography contain Miller's own account of this experiment. Miller--only partially successful because he saw the sun's corona for one brief period only--was a pioneer in this undertaking. Today, astronomers regularly view the sun's corona; success depends on the perfection of the equipment so that all of the sun's rays are excluded from the barrel of the telescope.

Professor Miller was the official representative of The University of Kansas at the dedication of Yerkes Observatory, at the inauguration of Dr. Von Kleinsmid as President of the University of Southern California, and at the dedication of Scripps College for Women at Pomona College, Claremont, California.

The newspaper article which announced Miller's retirement ends with the following description of one his great disappointments.

> Professor Miller will leave the university with the great hope of his life unaccomplished. He has been working for years for an astronomical observatory at the school, and there is no hope for such a structure until the next legislature meets at least; and at that time Professor Miller will have gone from the school. Professor Miller has seen the Science Building go up for Doctor Snow, the Mining Building for Professor Haworth, the Engineering Building for Dean Marvin, the Law Building for Dean Green and the Physics Building for Prof. L. I. Blake. And all the time he has been waiting and hoping for a building for astronomy. The university has a telescope and much apparatus used in astronomical observations and calculations, but has no building to use them in.

On retiring, Professor Miller expressed his appreciation to the chancellor and faculty of The University of Kansas thus: "I desire to express to you my heartiest thanks for the many tokens of your favor and good will, during all the years of my connection with the University, and especially for those of the past few days. Their memory will be a source of profound pleasure to me in the days that are to come." The faculty responded by drafting three resolutions:

> Resolved: that we congratulate Professor Ephraim Miller upon his long, honorable and efficient service as an active member of the faculty of this University--a service that has contributed greatly to the development of the institution from small beginnings to a large achievement.
>
> Resolved: that we particularly congratulate him upon the qualities which, throughout the whole period of that service, have commanded for him the affection and respect of his colleagues in the faculty, of the students and alumni of the University, and of all the people of the State with whom he has come in contact.
>
> Resolved: that we assure him that his retirement from active service does not alter the deep interest that we feel in his welfare, and that we bespeak from him as an Emeritus Professor a continuance of the interest that he has always shown in the progress of the University towards higher ideals and greater usefulness.

After leaving Lawrence, Professor and Mrs. Miller moved to Pasadena, California, where they had the pleasure and comfort of being near several of their children; in addition, they maintained close connections with their friends at The University of Kansas and with alumni of the University, and especially with those in California. The astronomers at California Institute of Techonology and Mount Wilson Observatory were kind to Miller, and he was able to pursue his interest in astronomy. Under the leadership of Registrar George O. Foster, Professor and Mrs. Miller's friends collected a fund to bring the Millers back to Lawrence to attend commencement in June 1921. The account of this commencement in *The Graduate Magazine* [Miller 16] states that at the University dinner, "Speakers included Ephraim Miller, professor emeritus of mathematics who was one of the most notable guests. Professor and Mrs. Miller came from Pasadena, Calif., although Professor Miller is 89 years old."

In April 1925, the K. U. Alumni Association gave a banquet at the Biltmore Hotel in Los Angeles, in honor of Professor Miller's ninety-second birthday. At this banquet Professor Miller read a paper which contained reminiscences of his early life; it was published in three installments under the title "Ephraim Miller's Recollections" in the *Lawrence Daily Journal-World* [Miller 6; S, Appendix I]. Further information about Professor Miller, including information about him after he retired and moved to California, can be found in a series of articles published shortly after his death [Miller 10].

Professor Miller died in Pasadena on November 20, 1930. The opening paragraph of the announcement of his death in *The Graduate Magazine* for December 1930 [Miller 11] follows:

> One of the richest personalities ever associated with the University of Kansas passed from mortal life when Prof. Ephraim Miller of Pasadena, Calif., died Nov. 20. He was 97 years old last April 25. He had been an active teacher at K. U. from 1874 to 1910. Since 1910 he was professor emeritus of mathematics, retired on a pension which came to him from the Carnegie Foundation for the Advancement of Teaching.

*The Graduate Magazine* for January 1931 published, under the general title "Adored Teacher was E. Miller", a series of articles written by friends and former colleagues which reviewed his career, told of his life in California after his retirement, and paid a tribute to him as the "adored teacher" [Miller 10].

A local newspaper, probably the *Lawrence Daily Journal-World*, announced his death in an article published November 23, 1930, which included a brief review of his life. This article contains statements by former Chancellor Frank Strong, Miss Carrie Watson, and Professor E. H. S. Bailey. Chancellor Strong had removed Miller from his position as Dean of the School of Arts in 1903, and it appears that neither Strong nor anyone else in the administration had any enthusiasm for Miller after that time.

> Dr. Frank Strong, who was chancellor of the University in the latter years of Professor Miller's service at the University, said:
>
> "Doctor Miller was for many years an influential member of the faculty and a man of highest character. He was an especially kindly man in all his relations with students and faculty. He was the predecessor of Prof. Olin Templin as dean of the College of Liberal Arts. He led a most useful life, and we all regret his passing. He lived out the term of a long and useful life.
>
> Miss Carrie Watson, librarian emeritus of the University, said: "It is with profound regret that I realize that Mr. Miller has gone. He has been my friend for many years. His kind spirit and noble life have always been my inspiration."
>
> Dr. E. H. S. Bailey, who with Doctor Miller was one of the founders of Sigma Xi here, said: "In the death of Professor Miller, the University of Kansas has lost one of its oldest professors, and the cause of education in Kansas, one of its most honored workers."
>
> The home of the Millers at Thirteenth and Tennessee streets was known by both students, faculty and citizens as a center of hospitality.

And then there arose, apparently spontaneously, the greatest tribute of all. The Class of 1881, planning is fiftieth reunion to be held at commencement in 1931, decided to have made a tablet or plaque honoring Ephraim Miller, their beloved mathematics teacher, and to dedicate it at commencement [Miller 8]. A bronze plaque, containing a copper engraving of Professor Miller and an appropriate inscription, was dedicated at ceremonies held in the rotunda of Frank Strong Hall on June 7, 1931 [Miller 9]. *The Graduate Magazine* contains a complete account of the class reunion and the dedication ceremonies, including a photograph of the plaque's unveiling [Miller 9]. The following is a part of this account.

> The largest class yet to have celebrated its fiftieth anniversary of graduation at the University of Kansas and one of the most loyal and enthusiastic of all classes came back to Lawrence this year and staged a Golden Anniversary reunion that threw a new light on alumni allegiance to K. U.
>
> Thirty-one persons received thirty-two degrees in the spring of 1881 but, so far as class organization is concerned, it seems that only those who studied liberal arts courses were counted. The class, therefore, was considered as having nineteen members, fourteen of whom received the A.B. and five the B.S. degree.
>
> Thirteen of those nineteen are living and eleven were present for the reunion. The other two were none the less interested but Stuart O. Henry, now living in Nice, France, was unable to make such a long trip for the occasion and Erasmus Haworth was unavoidably detained at Washington, D.C., where he is staying temporarily with his son.
>
> There were dinners together, the chief of which was at the home of Charles S. Finch, fs '81, and Mrs. Finch, and visiting generally, and a place in the spotlight at the annual Commencement dinner Monday noon, and pictures taken, and gold medals awarded, and all sorts of festivities,--but the major event of the entire program was the presentation by the class of a bronze plaque in memory of Prof. Ephraim Miller.

This event took place Sunday afternoon, June 7 at 3:30 p.m. in the rotunda of Central Administration Building where the plaque will be hung. For the ceremony the plaque was on an easel and was veiled.

Charles S. Finch presided. After the invocation by the Reverend Theodore Aszman and singing of Crimson and the Blue led by Dean Swarthout of the School of Fine Arts, Mrs. Mina Marvin Wilcox presented the plaque as the gift of the Class of '81. Margaret Stanley of Wichita, great grand daughter of Professor Miller, unveiled the tablet.

Speaking on behalf of the University, Chancellor Lindley accepted the gift. The University String Quartet played a number to end the program.

Mrs. Mina Marvin Wilcox was the daughter of Chancellor Marvin, the sister of Dean Frank O. Marvin, and the wife of Professor Alexander Martin Wilcox, Professor of Greek Language and Literature. In presenting the plaque in memory of Ephraim Miller, Mrs. Wilcox made the following remarks.

In February, 1875, I was enrolled in the University as Junior Prep and then began my acquaintance with Prof. E. Miller. For in that early day the status of a sub-freshman was quite different from his position today. Instead of being a part of the laboratory equipment of the School of Education he was an integral part of the student body; his classes often taught by full professors, or heads of departments, the best the University had to offer. And so it was that we came at once under Professor Miller's influence. Indeed for some time Prof. Miller was the Department of Mathematics. Yet his labors were not confined to that subject. In those days when the Library was a mere embryo and a Librarian as we now think of that officer was beyond all possibilities, it was Prof. Miller who found time to organize what books there were and with student monitors at certain hours, make them available for students' use. It was a great day for the Library when Miss Carrie Watson, still under Prof. Miller's supervision, became the regular assistant.

A little incident comes to my mind which is so characteristic of the man and shows so well his self-forgetful interest in the general welfare that I tell it, slight tho' it is.

At a somewhat later time, when music had become an organized department and was housed in the third story of Fraser, a man rather unusually sensitive to rhythm and tune complained strenuously of being disturbed by the piano practice over his head. It was Prof. Miller who offered to change lecture-rooms with him.

Students are proverbially critical, but a consensus of opinion on men and affairs about the campus is on the whole pretty certain to be very near the truth. I do not recall ever hearing Prof. Miller's competence as a mathematician questioned by his students; but he was generally recognized as preeminently a teacher. He knew his subject, as every good teacher must, and he continued his own studies, as every good teacher does, coming to each succeeding class with some fresh method of approach. There were no traditions handed down from class to class of how Prof. Miller would introduce this topic, or what story he would tell to illustrate that point.

But we think more often of Prof. Miller's vital human interest than we do of his attainments as a scholar or his abilities as a teacher. It could never be said of him as I recently heard it said of a Professor in another institution, "He knows his subject and can teach it, but he is utterly impersonal and unhuman." Prof. Miller did not make mathematicians of us all, but he did make us feel his warm personal interest in each one of us, with the result that he was one of the most loved men in our faculty.

I was recently looking over a file of programs of the Old and New Club of which Prof. Miller was an active member for 25 years or more. Since the men choose their own subjects for their papers, the list, carried through a series of years, is a significant indication of the things that interest them. Of course purely technical subjects would not be found in these programs so mathematics had a very small place in Prof. Miller's list. However, the mathematical influence may be seen in the clear and concise statements of his titles, leaving no uncertainty as to the subject to be treated. Some of the men, I noticed, were prone to use general titles that might mean anything or nothing. I was surprised to find Astronomical subjects occurring so frequently over Prof. Miller's name. I knew that he had taught some classes in elementary astronomy here at the University, but I thought his special interest had developed after his retirement to Pasadena, through his associations with the men connected with the observatory near there. These programs prove it to have been a favorite side-line, almost a hobby. Religion in various phases was evidently a major interest. Topics of the day, history and recent literature received about equal attention. These, although inadequately, suggested the various interests which made Prof. Miller so good a companion for people of diverse tastes and, doubtless, contributed to that youthfulness of spirit unquenched by ninety years and more of life.

But we who knew Prof. Miller well cannot think of him apart from his home, with his wife and children; a beautiful home where the door was always open and a cordial welcome given to all who sought its hospitality. It was a student's own fault if he did not avail himself of it. Our thought today crosses the miles to that home in Pasadena where Mrs. Miller is still keeping open house for any and all who come in the name of K. U., for she shares fully her husband's loyal love for the University. I hope the usual message of remembrance may be sent to her tomorrow.

The tablet which we have met to dedicate will be unveiled by Prof. Miller's great-granddaughter, Miss Margaret Stanley.

Mr. Chancellor, when future generations of students shall ask the meaning of these tablets may they be answered in this wise: These are they whose lives were builded into our University in the pioneer days when loyalty often meant a sacrifice of personal interests. With devotion to scholarship as such; with varied interests; with an abiding love for fellow men; with a religious faith prevading all of life;--this man, Prof. E. Miller, so influenced his students that men and women fifty years after college days had ended cherished his memory and placed this tablet in the hope that our University may ever have such men to serve her.

The bronze tablet was permanently mounted on the west wall of the rotunda in Frank Strong Hall, and there it still displays its copper engraving of Ephraim Miller and the following inscription:

To the Revered Memory

of

Ephraim Miller A.M. Ph.D.

An Accomplished Scholar and an
Inspiring Teacher Who for Thirty-Six
Years 1874-1910 Devoted His Life and
Talents to the Instruction of Students
in the University of Kansas.

This Tablet

Is Affectionately Dedicated on the
Occasion of Its Fiftieth Anniversary

By

The Class of 1881

## Chapter 3

## The Beginning of the Long Decline

### 1910-1925

Chancellor Frank Strong visited the campus in the spring of 1902; Taft describes him as follows [Taft 1, pp. 74-75].

> Strong's affable manner, commanding stature, and glowing recommendations from many of the country's leading educators, won for him the approval of the Board and he was unanimously elected to the Chancellorship on April 16, 1902. Immediately upon his election he was interviewed by an enterprising reporter. "I like the Middle West", Strong told him, "especially the state of Kansas, and from what I have seen of Lawrence, I think I shall like the city as a home. It seems to me the possibilities of this school are great. Look at Nebraska with 2,500 students. I see no reason why we cannot have as many or even more in Kansas. We ought to draw heavily, not only from every county in Kansas, but from all contiguous states. My hobby is to organize. I want every alumnus to work with our university. The whole state must unite in building up the school." Further, in reply to a question on his attitude toward athletics, he replied: "I always encourage college sport of every kind and like to see live college spirit. I hope we can soon have a good gymnasium for our students."

As this statement suggests, Chancellor Strong was an organizer and a promoter. As he began his administration in 1902, Strong was determined to increase the size of the university (its enrollment, the size of its campus, and the number of its buildings) and the scope of its program of instruction and research (the number of its departments and schools), and to expand the University's services to the state (through the Medical School, but also through the

Extension Division and other special bureaus and agencies). An ambitious program of this kind required massive financial support from the Legislature for salaries, operating expenses, and for buildings and equipment. Chancellor Snow had increased the enrollment from 505 to 1154, but he had succeeded in increasing the annual legislative appropriation for current expenses only from $75,000 to $135,000. Thus the University had already fallen behind in its finances; Chancellor Strong had to make up the deficit and raise large additional sums if his program was to succeed.

Chancellor Strong developed a plan of action very quickly. Fortunately for him, Olin Templin had announced the establishment of *The Graduate Magazine* at commencement in June 1902, and the first number was published in October 1902, almost simultaneously with Strong's inauguration as chancellor [Templin 7; *The Graduate Magazine* 3]. *The Graduate Magazine* became an instrument for developing the Alumni Association into a lobby with the Legislature for the benefit of the University [Templin 12]. The early volumes of *The Graduate Magazine* systematically published articles on the early history of the University and on its outstanding faculty members and alumni. These articles helped to develop alumni morale and loyalty and to convert the Alumni Association into a strong organization for the support of the University. Having strengthened the Alumni Association, Chancellor Strong then used *The Graduate Magazine* as a channel for communicating the University's needs to the alumni and seeking their support for his requests from the Legislature. A final step in Chancellor Strong's preparation was the reorganization of the Endowment Association so that it would be more effective in seeking private gifts for the University [Templin 9].

Chancellor Strong began his campaign vigorously. He published an article in the November 1904 number of *The Graduate Magazine* in which he described the needs of the University for the next two years [Strong 3]. He followed this in

January with a lengthy article addressed "To the Graduates and Friends of the University of Kansas" [Strong 4]. The first sentence sets the tone for the entire article: "The earnest attention of the graduates, former students, and friends of the University of Kansas is called to the fact that the situation of the University both as to general income and buildings is nothing short of alarming." But Chancellor Strong was business-like in his alarms. His article contained detailed statistics and elaborate tables to demonstrate the University's needs, to show how K. U. was falling behind other universities, and to explain how the state could pay if it only would.

Chancellor Strong emphasized not only the needs of the University but also the practical value of the University to the state; he systematically promoted "State service". Furthermore, he called on others to help him in his campaign to publicize the needs of the University and to explain its practical value to the state. For example, Dean F. O. Marvin published an article which emphasized the growth in the University's enrollment and its burgeoning needs, especially in the field of engineering [Marvin 4]. Erasmus Haworth published an article [Haworth 4] which described "the imperative necessity of a new building for the department of mining engineering, geology, and for the work of the State geological survey". The state,of course, had long recognized and appreciated the practical value of some of the work carried on at the University. Taft has written about this aspect of the University's work [Taft 1, p. 45].

> In the period of the nineties alone this faculty group published over four hundred books and research articles. Many of them, to be sure, were of academic interest only, but many were of immediate practical value to the state itself. The researches of Snow in particular were of special interest to the state and did much to stimulate goodwill toward the University among its citizens. A state that was particularly "bug-conscious," because of the grasshopper infestations of

> 1866, the particularly severe one of 1874 and the chinch bug invasion of the late eighties, welcomed any information on the types, life histories, and control of insects in general.

In 1882 Snow had been appointed entomologist to the State Board of Agriculture; later Snow operated from the University a major project for the control of chinch bugs by inoculating healthy bugs with fungus in order to spread the contagion [Hyder 1, pp. 191-195]. Chancellor Strong hoped to turn such services to the state into financial support for the University. W. C. Hoad, an alumnus of the School of Engineering, published an article entitled "The Good Roads Movement in Eastern Kansas" which a footnote described as "the first in a series of articles suggesting the practical relationship of the University and its alumni to the economic and social well being of the State" [Hoad 1]. Shortly afterward E. H. S. Bailey published an article entitled "The Practical Side of Some Scientific Work in the University", which a footnote called "the second of a series of articles suggesting the practical relationship of the University to the welfare of the State" [Bailey 8].

Chancellor Strong's vigorous and business-like approach was successful at first. An editorial in the March 1905 number of *The Graduate Magazine* explains that the Legislature's appropriations in the spring of 1905 represented a big increase; more precisely, the total direct appropriation to the University from the state was $560,000, an increase of 43 percent over the past biennium [Strong 5]. The new buildings added to the campus during the first ten years of Chancellor Strong's administration are another indication of his early successes: Green Hall was completed in 1905; Robinson Gymnasium in 1906; Marvin Hall and the Mechanical and Hydraulic Laboratories in 1908; Haworth Hall in 1909; and the east wing of Strong Hall in 1911.

Chancellor Strong continued to state the needs of the University in *The Graduate Magazine*; before each meeting of the Legislature he published a detailed account of the University's needs and sought the help and support of friends and alumni in his efforts to obtain the needed funds from the Legislature [Strong 6, 7, 8]. In spite of increases in the Legislature's appropriations, however, the University's financial position did not seem to improve. For example, Chancellor Strong's article in December 1906, addressed "To the Graduates and Friends of the University of Kansas", explains--in preparation for the next meeting of the Legislature--the University's need for funds for operations, maintenance, and new buildings. Chancellor Strong acknowledged that the last Legislature had given some increases in support but insisted that growth in the University's enrollment had nullified all of the gains [Strong 6]. The article is complete with tables showing the enrollments in the various divisions of the University from 1901-1902 through 1906-1907. There are also tables which compare the financial support with that of other universities by other states.

Chancellor Strong was remarkably successful in increasing the University's enrollment. The total registration was 1,154 in 1900-1901, the last year in which Snow was chancellor, but the total registration was 2,398 in 1910-1911. Of these, 2,176 were registered in the regular session and an additional 222 were registered in the summer session.

The rapid growth in the University's enrollment and the sudden and unexpected collapse of the staff of the Department of Mathematics in the winter and spring of 1910 created a serious situation. It had been known at least as early as December 1909, that Ephraim Miller would retire in June 1910, but Newson's death in February 1910 was wholly unexpected. Chancellor Strong had expected Newson to succeed Miller as the Chairman of the Department, but suddenly he was not available. Of the eight staff members who taught in the Department in 1909-1910, only three remained on the staff in 1910-1911: John Nicholas Van der Vries, Associate Professor; Charles Hamilton Ashton, Assistant Professor; and Arthur Bowes Frizell, Instructor. Two others, U. G. Mitchell and A. D. Pitcher, were known to be available for 1910-1911. These two men had received master's degrees in 1907, and had served as instructors during 1906-1907 and 1907-1908. During the two years 1908-1910 they had been on leave as graduate students--Mitchell at Princeton and Pitcher at Chicago. They received Ph.D. degrees from their respective universities in 1910, and both agreed to rejoin the staff of the Department in September 1910. In spite of the return of these two, the Department needed additional staff members as well as a new chairman.

One immediate result of Miller's retirement was a change in the name of the Department. It had been the Department of Mathematics and Astronomy, but beginning in 1910-1911, and always since that time, its official name has been Department of Mathematics.

After Newson's death, there was a critical and urgent need for a new chairman to take charge of the Department in September 1910. Chancellor Strong personally conducted the search for the new chairman; the University's files contain copies of three letters he wrote seeking a leader for mathematics. In mid-April Strong asked Charles R. Van Hise of the University of Wisconsin in Madison for confidential reports on two candidates.

> We are looking for a man for the headship of our department of Mathematics in the place of Professor H. B. Newson who died very suddenly a few weeks ago. Two men in your University have been mentioned to us, Mr. Mason and Mr. Dowling. If it is agreeable to you and you care to do so I would very much like to have a frank and confidential statement in regard to them covering not only their ability and training, but also their personal characteristics and life and their special fitness for the headship of a department. The salary will be $2500, which is our maximum salary at the present time. The cost of living here is moderate and that amount here is equivalent to rather more than in the universities farther

> east and in larger cities. We need a strong man for the department is an important one and large one. It now includes eight or nine teachers, and there will soon be twelve to fifteen.

Frank Strong wrote a similar letter to Professor Gustav Gruener of Yale University, seeking information on "Professor Dowling and Professor Richardson [who] have been mentioned to us as suitable men for the position". Chancellor Strong also wrote to the President of Brown University, W. H. P. Faunce, requesting a recommendation for "Mr. Richardson, who is [now] teaching mathematics in Brown University [and who] has been mentioned to us as a man capable of heading a large and important department".

Although these letters did not succeed in obtaining a head for the Department of Mathematics, they do supply some very interesting information. First, Chancellor Strong was forced to apologize for the low salary he offered. Second, he had expected that Henry Byron Newson would head the Department after Miller's retirement. Third, Chancellor Strong had a very high opinion of his Department of Mathematics; the three men whom he sought as the new head were among the best in the United States. (See the biography of L. W. Dowling in the Second Edition, 1910, of *American Men of Science* [Appendix IX, Dowling] and the biographies of Max Mason and R. G. D. Richardson in the Sixth Edition, 1938, of *American Men of Science* [Appendix IX, Mason, Richardson].) Although Dowling received a "star" in the Second Edition (1910) of *American Men of Science*, it seems that he did not achieve a position of national prominence: his name, for example, does not appear in the index of Archibald's *History of the American Mathematical Society* [Archibald 1]. Max Mason was unusually distinguished among the mathematicians. He too received a "star" in the Second Edition (1910) of *American Men of Science*, and later Mason was President of the University of Chicago and of the Rockefeller

Foundation. R. G. D. Richardson received a "star" in the Third Edition (1921) of *American Men of Science*. As Chairman of the Department of Mathematics and Dean of the Graduate School of Brown University, and as Secretary of the American Mathematical Society from 1921 to 1940, Dean Richardson played a leading role in American mathematics in the period between the two World Wars. His photograph, biography, and bibliography may be found in Archibald's *History of the American Mathematical Society* [Archibald 1, pp. 103-105].

The replies Chancellor Strong received to his inquiries about Dowling, Mason, and Richardson are not known, but no one of the three became the next head of the Department. Nor is anything known about the remainder of the search, but the new head of the Department was John Wesley Young. The Second Edition (1910) of *American Men of Science* was the first one in which J. W. Young was listed; in it he received a "star". In the preface to the Second Edition, J. McKeen Cattell, the editor, explained that "the thousand leading men of science have been again selected by the methods that were used before, and stars have been added to the subjects of research in the case of 269 new men who have obtained places on the list." Young's biography gives his address as 1702 Massachusetts Avenue [sic], Lawrence, Kansas; this address shows that Professor Young had moved into the house where Henry Byron Newson and his family had lived the preceding year.

J. W. Young, although only thirty years old when he arrived at The University of Kansas in September 1910, had already risen to a position of national prominence. He had been a preceptor at Princeton University from 1905 to 1908, and there he had begun collaboration with Oswald Veblen on their widely known two-volume work entitled *Projective Geometry*; the preface to volume I is dated August 1910 [Young 1]. Veblen explains in the preface to volume II that Young had only a very small part in the writing of this volume [Young 2]. Young's book, *Fundamental Concepts of Algebra and Geometry* was based on lectures given at the University of Illinois in the summer of 1909; the preface is dated April 1911, in Lawrence, Kansas [Young 3]. Young had spent two years as an assistant professor at the University of Illinois after leaving Princeton and before coming to The University of Kansas.

J. W. Young was nationally prominent in the affairs of the mathematicians. Archibald's *History of the American Mathematical Society* contains many references to him [Archibald 1, index]. For example: J. W. Young was a member of the American Section of the International Mathematical Union; he was a member of the committee of publication of the *Bulletin of the American Mathematical Society* from 1914 to 1925; Young was chairman of a Joint Committee on Funds for the American Mathematical Society and the Mathematical Association of America, which was appointed in September 1930; Young was an editor of the AMS Colloquium Publications during 1929 and 1930; he was a member of the Council of the American Mathematical Society from 1911 to 1913; he was a member of the Board of Trustees of the AMS in 1923; and he was a vice president of the American Mathematical Society in 1928 and 1929.

J. W. Young was prominent also through family connections [Archibald 1, p. 144]. E. H. Moore at the University of Chicago was ranked first in the nation by the mathematicians at the time of publication of the First Edition of *American Men of Science* in 1906. (For the 1906 ranking of the eighty leading mathematicians, see the appendix to the Fifth Edition [1933] of *American Men of Science*.) E. H. Moore himself was born in Marietta, Ohio, but his grandfather was a banker and treasurer of Ohio University in Athens, Ohio. Archibald states that "his father was a Methodist minister, David Hastings Moore, and his mother was Julia Carpenter Moore of Athens. The family moved from place to place while E. H. Moore was young, but a considerable part of his childhood was spent in Athens, where one of his playmates was Martha Morris Young, sister of the lamented Prof. J. W. Young of Dartmouth C., who was afterwards to become his wife." Thus, J. W. Young's brother-in-law was E. H. Moore at Chicago, who was ranked first among the mathematicians of the United States in 1906.

Even the most skeptical would be forced to concede that Chancellor Strong had been remarkably successful in obtaining an outstanding mathematician to be the new head of the Department of Mathematics. The future of the Department seemed assured.

Staff of the Department of Mathematics

1910-1911

John Wesley Young, Professor of Mathematics and Head of the Department
104 Blake Hall 1702 Massachusetts Street
John Nicholas Van der Vries, Associate Professor of Mathematics
108 Marvin Hall 1644 New Hampshire Street
Charles Hamilton Ashton, Associate Professor of Mathematics
108 Marvin Hall 1202 Ohio Street
Ulysses Grant Mitchell, Assistant Professor of Mathematics
203 Fraser Hall 1240 Rhode Island Street
Arthur Dunn Pitcher, Assistant Professor of Mathematics
108 Marvin Hall 325 Indiana Street
(Miss) Marion Ballantyne White, Ph.B., 1893 (University of Michigan); A.M., 1906 (University of Wisconsin); Ph.D., 1910 (University of Chicago). Assistant Professor of Mathematics, 1910.
203 Fraser Hall 1108 Ohio Street
Arthur Bowes Frizell, Instructor in Mathematics
108 Marvin Hall 940 Indiana Street
George Wellman Hess, Instructor in Mathematics
108 Marvin Hall 1501 Rhode Island Street

C. H. Ashton was promoted to Associate Professor in 1910, and Mitchell and Pitcher were promoted to Assistant Professor at the same time--they had just received their Ph.D. degrees. Miss Marion B. White is not listed in any edition of *American Men of Science*, and nothing is known about her beyond the information given in the staff list above. For a biography of George Wellman Hess, see the Sixth Edition (1938) of *American Men of Science* [Appendix IX, Hess].

Although at first glance the staff for 1910-1911 appears to be an excellent one, a close examination reveals certain weaknesses. More than half of the staff--including the head of the Department--was new: only three of the eight staff members were at the University during the preceding year. Also, the staff was a young one. The oldest member, Frizell, was forty-five years old, but he was only an instructor. The Head of the Department (as J. W. Young was called) was thirty years old and, with the single exception of A. D. Pitcher, he was the youngest member of the staff. Furthermore, Young's background was largely eastern, and he did not find Lawrence very acceptable--neither did Lawrence find the Young family entirely acceptable. Finally, the office assignments could hardly have been worse: Professor Young, the Head of the Department, was isolated in Blake Hall, two members of the staff had offices in Fraser Hall, and the other five had offices in Marvin Hall. For all of these reasons it was hard to build morale and an *esprit de corps*, and the situation suggests a large amount of uncertainty about how strong the ties of loyalty would be when the real tests came.

For severe tests had come in the past, and in 1910 the University found itself on the threshold of serious troubles again. The financial panic of 1873 was accompanied by plagues of grasshoppers that ate up all of the crops in 1874. The legislature cut the University's appropriation from $36,000 to $24,000, and there was an open quarrel between Chancellor Fraser and his faculty--a quarrel which the Board of Regents settled by demanding the resignations of both the Chancellor and the faculty. Fred Ellsworth has sketched the beginning of the next period of trouble [Ellsworth 1, part I, p. 23].

> Then came evil days again in Kansas. The cattle market broke in the middle of the '80s, and other economic conditions worsened.

> A political party known as the Populists formed. It was their mission to overthrow the ruling classes. They sent Sockless Jerry Simpson to Congress. Mary Elizabeth Lease of Wichita loudly advised the farmers to raise less corn and more hell. They all joined in denouncing the privileged classes and businesses, particularly the railroads and banks. They succeeded in electing a governor in 1892, and had control of the Legislature at one time.

An understanding of the People's Party, the members of which were called Populists, is necessary for an understanding of a long period of Kansas history. Fortunately, the history of the People's Party can be found in great detail in *The Populist Revolt: A History of the Farmers' Alliance and the People's Party* by John D. Hicks [Hicks 1]. The People's Party was organized as a result of economic difficulties of the farmers and abuses of many kinds that accompanied and followed the settling of the West after the Civil War. The farmers felt that they were the innocent victims of tyranny imposed on them by the railroads, trusts, big business generally, and an unsympathetic and oppressive government. The Populists were the radicals of the 1890s, and they were sometimes violent in their efforts "to overthrow the ruling classes". For example, Lorenzo D. Lewelling was elected Governor of Kansas by the Populists in 1892; the Populists controlled the Senate, but the Republicans controlled the House by a narrow margin. In the ensuing struggle between the Populists and the Republicans for control of the Legislature, Governor Lewelling called out the National Guard in an effort to control the warring groups, and bloodshed was narrowly averted [Hicks, pp. 274-281].

During the course of the struggles between the Populists and the Republicans, Chancellor Snow and the University suffered serious political interference. Hyder's biography of Snow describes these troubles in detail [Hyder 1, pp. 205-212], and Fred Ellsworth has described them briefly as follows

[Ellsworth 1, part II, p. 22].

> Chancellor Snow's troubles with the Populists in the state administration and the Legislature were many and were rugged. He skated along some years with three of the seven members of the University Regents of the Populist faith. One of those was a good regent, but he was squeezed off the job by an ambitious and nosy Republican state chairman.
>
> The state college at Manhattan was not able to hold the line against misguided politicians. There, the president, George T. Fairchild, lost his job, as did more than half of the faculty. Naturally, some years were required before the college became stabilized again.
>
> The whole episode came to a climax in 1897 when Snow saved his own job by some fast political maneuvering and the help of two good alumni, Charles S. Gleed and Charles F. Scott. They managed to delay a legislative bill which would have reorganized the Chancellor out of his position. With that measure thwarted, the uproar was settled. No such movement came up again.

The People's Party lost strength rapidly after 1900, but small groups held conventions to nominate a candidate for president as late as 1904 and 1908. The Populist Revolt was almost a religious crusade; the Populists felt that the wrongs and injustices committed by the ruling class justified the violence of the attack upon them. Although the People's Party disappeared as a political organization, many of the reforms it had advocated were later written into law [Hicks 1, ch. 15]; furthermore, the Populist Revolt left its mark on Kansas. The name Kansas is associated, in the minds of many Americans, with a harsh climate, tornadoes, radical groups, and violence--with John Brown, Quantrill's raid, and the struggles over slavery, but also with Carry Nation, Sockless Jerry Simpson, Mary Elizabeth Lease, and all of the excesses of the Populist Revolt. William Allen White's famous editorial entitled "What's the Matter with Kansas?" was written in 1896; described as "an impassioned plea against populism", it apparently has succeeded in immortalizing the belief that something *is* wrong with Kansas.

But even after the People's Party disappeared as a political organization, there remained a Populist legacy of attitudes, memories of grievances, convictions that the people were the victims of oppression by the ruling class and injustices by government, and violent debate and action. Thus it seems likely that the Populist Revolt contributed indirectly to troubles which soon developed for the University. After 1900 the agricultural states grew more prosperous, and the improved economic situation was reflected in student life on the campus. The University was criticized because of the extravagant dress and social life of its students. These criticisms came, not only from the University's detractors, but also from its friends. For example, Cora Pierson Hopkins wrote a letter to the editor of *The Graduate Magazine* in January 1906 [Hopkins 1], the opening paragraph of which reads, "We are hearing much these days about a need of reform in the student social life at the University. Not only those who may be called 'outsiders,' but also many friends, alumni, and former students are criticising the University on account of the lack of wholesome moderation evidenced in the students' social functions." Mrs. Hopkins pointed out the problem and stated that it was really up to the students to straighten things out--that there was not very much that others could do about the situation.

Almost immediately, however, there was a far more serious problem. Governor Hoch proposed that the three separate Boards of Regents for the State schools be replaced by one Board consisting of three men who would devote full time to their employment on the Board, and who would each be paid $1200 (and expenses) annually. In March 1907, W. H. Carruth published an article entitled "The Single Board of Regents" in *The Graduate Magazine* in which he strongly opposed Hoch's proposal [Carruth 1]. Apparently the basis for the governor's proposal was the belief that a single Board of Regents would be able to prevent wasteful duplication of work by the various State schools.

An editorial in *The Graduate Magazine* of May 1908 [*The Graduate Magazine* 6] opens with the statement that "the steps recently taken by Governor Hoch in the direction of a better adjustment between the fields of work covered by the three State educational institutions have been watched with more than passing interest". This editorial emphasizes the University's alarm, and suggests that much damage could result to the University from the governor's proposals.

An editorial entitled "Three State Universities in Kansas" appeared in the March 1909 number of *The Graduate Magazine*, indicating that the controversy was still growing [*The Graduate Magazine* 7]. This editorial deals with the struggle going on between The University of Kansas and Kansas State University at Manhattan over the programs of study offered by the two schools. The opening paragraph of the editorial follows.

> As being by far the most important matter which had concerned the University in many years, the question of the relations between the University and the Agricultural college was discussed at length in the last biennial report of the Regents to the Governor of Kansas. Here the University administration stopped. The subject was, however, laid before the legislature in a bill prepared by Regent Edwin Taylor of the Agricultural College. The legislature took no action on the bill.

The Agricultural College mounted a strong attack on the University, claiming that the University was trying to keep it from establishing a program in engineering, and that, in turn, the University was about to start its own School of Agriculture. Friends of the University claimed that the state constitution required the University to teach agriculture. Officially, the University took a "hands off" attitude, but clearly it was deeply concerned over what it viewed as a move which would result in three state universities in Kansas. The University felt that Kansas could not support three good universities. When the legislature took no action on the bill of Regent Edwin Taylor of the Agricultural College, both the University and the Agricultural College interpreted this inaction as meaning that they should proceed with their separate plans--plans which the University believed would result in three universities for Kansas.

The March 1911 number of *The Graduate Magazine* contained a complete report on legislative actions that concerned the University. First, there was a report on appropriations for the University [*The Graduate Magazine* 8]:

| | |
|---|---|
| Amount asked for, including interest and fees | $1,305,315 |
| Amount received | 993,770 |
| Cut from budget | 311,545 |
| | |
| Received for 1909-1911 | $1,076,096 |
| Received for 1911-1913 | 993,770 |
| Below last biennium | 82,326 |

The appropriations report summarized the situation by saying [*The Graduate Magazine* 8, p. 227], "This is the worst treatment the University has met with in many years...". The second action by the legislature which concerned the University was described under the heading "The Single Board Idea" [*The Graduate Magazine* 9]. The following paragraph is taken from a letter written by the governor to Representative A. M. Keene of Fort Scott, who was appointed chairman of the commission described in the letter.

> A bill providing for one governing board for the state educational institutions, including the schools for the deaf and

> the blind, was passed by the Legislature but vetoed by the governor. Immediately after disapproving of this bill, the governor appointed a commission whose duty it is "to investigate the policies, plans, efficiency, management and control of the educational institutions of this state as well as of other states throughout the country, with a view to placing all facts before the next session of the legislature, together with a recommendation of a plan which will have for its purpose the thorough and earnest cooperation of the three great educational institutions of the state and the elimination of all unnecessary duplication of work and competition".

The *Graduate Magazine* article gives the full statement of a bill that was introduced in the Senate but defeated there. It describes also a bill introduced in the House, passed by the House and the Senate, and then vetoed by the Governor. The proposal for a single Board had become a hot political issue, and it was debated vigorously, with strong language being used by both sides. Later articles in *The Graduate Magazine* showed that Kansas State College received more favorable treatment from the legislature than the University did. The controversy boiled. But the University was certain that the single Board of Regents, although vetoed by the Governor in 1911, would be established by the Legislature in the spring of 1913.

At the end of the academic year 1910-1911 John Wesley Young resigned as Head of the Department of Mathematics and accepted a Professorship in Dartmouth College. Furthermore, Young took A. D. Pitcher with him: Pitcher resigned and accepted an Assistant Professorship in Dartmouth College. These two resignations marked the beginning of a long decline for the Department--a decline that was partially obscured for several years by the brilliant successes of Solomon Lefschetz. Because Professors Young and Pitcher left abruptly after only one year on the staff, and because their departure marked a turning point in the history of the Department, an investigation into the reasons for their resignations is in order.

In the April 1912 number of *The Graduate Magazine*, Arthur H. Bayse published an article entitled "Dartmouth and the University" [Bayse 1]. It describes the close relations which had existed between Dartmouth and the University; there had been many cases in which faculty members had moved from one of the institutions to the other. In most cases faculty members had gone from Kansas to Dartmouth, but there had been a few transfers from Dartmouth to Kansas. Bayse's article states that "Professor J. W. Young, last year at the head of the mathematics department at Kansas, is now here [at Dartmouth] in the same capacity. With him came A. D. Pitcher, '06, as assistant professor in the same department; Mrs. Pitcher is likewise a graduate of the University. M. Gaba, who taught for two years at Kansas, is here as instructor in mathematics." Thus, in trying to assess the reasons for the resignations of Young and Pitcher, we observe that Dartmouth was in the habit of taking faculty members from Kansas, and that Gaba (in 1910) and Young and Pitcher (in 1911) were merely its latest recruits, in mathematics, from Lawrence.

What reasons did Young himself give for his sudden and unexpected resignation? Young did not give his reasons, although several years later he had an opportunity to explain his departure. In the spring of 1914, Ephraim Miller, retired and living in Pasadena, published an article [Miller 17] entitled "Formerly in the University Faculty". Ephraim Miller had been personally acquainted with nearly everyone mentioned in his article, and he wrote letters to all of them; in most cases, he published a part or all of their replies. Miller had not known J. W. Young, but nevertheless he wrote to him. Miller's article reports only that Young "says that his brief residence in Lawrence, and his brief connection with the University there, has produced the pleasantest of memories, and he will always look back to his year there with the greatest of pleasure". This statement is a polite one, but it does not contain any clues to the reasons for Young's resignation.

Since Young did not record the reasons for his resignation, we are forced to conjecture that he resigned because of the situation he found in Kansas, in the University, and in the Department--in short, because Dartmouth seemed to offer a better opportunity than Kansas. The following paragraphs, taken from reminiscences written by Mrs. Wilimina Everett Pitcher in 1971, throw light on the situation and on some possible reasons for Young's resignation [S, Appendix II].

> Then we were told Young was going to leave. Young, a Cornell Ph. D., probably was glad to get the Dartmouth offer. In the early 1900's there seemed to be a widespread feeling of "Go East, Young Man." Kansas probably seemed a good place to go from.
>
> Many new faculty women, coming to K. U. from eastern states, were surprised at our general state of civilization. They were surprised that our only Indians were peaceful, well housed and well cared for at Haskell. One woman, not a math department wife, who marvelled at what she found in Kansas, told that before she packed to come, she bought a dozen pairs of kid gloves, because she was sure she could not buy any in Lawrence.
>
> The Youngs had a baby daughter. Mrs. Young's sister spent much time with them. The four of them were living in a house which the Newsons owned and had lived in for years. The Newsons had cats. I don't know how many--two or more. Being normal cats they had fleas. Early in the school year the Youngs moved out of the house for several days and had it fumigated. Mrs. Young said they were over-run by fleas. I don't know how many or how bad the fleas were. I don't suppose the flea story made Mrs. Young popular. The Newsons were old residents of the community.
>
> Professor Young was a Cornell Ph. D. Dartmouth was a highly respected Eastern College. Being head of a department at Dartmouth probably sounded better than being head at K. U. The salary was probably better at Dartmouth. I do not know.

These comments by Mrs. Pitcher emphasize Young's Eastern background and attitude and also the opinion widely held, especially by Easterners, that Kansas was an uncivilized place that should be avoided.

Kansas suffered from its lack of appeal; in addition, J. W. Young could certainly point to unsatisfactory elements in the current situation and to warnings of much more serious troubles in the future. Chancellor Strong, in seeking a new head for the Department had apologized for the low salaries offered by the University, and the evidence indicates that Dartmouth offered him a substantial increase in salary. As pointed out earlier, the Department had very poor offices in 1910-1911: Young was isolated in Blake Hall, and the other members of the staff had offices in Fraser and Marvin Halls. To be sure, offices, classrooms, and a departmental library were nearing completion in the east wing of Strong Hall (this part of the building was occupied in 1911), but Young could observe that the legislature in the spring of 1911 cut the University's appropriation for buildings, providing only "the appropriation of $42,500 for the foundation of the second section of the Administration building (Strong Hall), and $7,500 for a clay working laboratory" [*The Graduate Magazine* 29, p. 228]. Young's confidence in the future was certainly not increased when *The Graduate Magazine* summarized the legislature's appropriations for the University in the spring of 1911 as "the worst treatment the University has met with in many years. . .". Furthermore, the faculty was restless, unstable, impatient, vociferous, and beginning to show signs of revolt.

The rapid growth in the University's enrollment required the addition of many staff members, most of whom were young and many of whom were inexperienced, temporary instructors. The record of staff members in the Department clearly indicates this change in the character of the staff as compared with the period before 1900. Minutes of the University Senate and other records describe a vociferous and outspoken faculty, and events to be described presently show that the first signs of an impending faculty revolt were already visible in

1911. Finally, Young certainly observed the plans of the governor and the legislature to tighten their control over the three state schools. The governor had vetoed a bill to establish a single Board in the spring of 1911, but the University itself confidently expected the single Board to be established by the next legislature--and with damaging consequences for the University. In the light of all these circumstances, it is hardly surprising that Young resigned when he was offered a good position at Dartmouth College.

In reminiscences written in 1971, Mrs. Arthur Dunn Pitcher has explained why her husband resigned his position in the University and accepted the offer from Dartmouth College [S, Appendix II].

> We were surprised when Arthur was asked to go to Dartmouth. He had taught 1910-11 at K. U., $1200 for 3 years with prospect of $1300 for the fourth year, then $100 yearly increase to $1600. I can't find, though I must have, Dartmouth's original offer. As a result of the offer, K. U. raised to $1300 the second year, with $100 yearly increase to $1600. Arthur agreed to stay and asked that Mitchell be put on the same schedule. Then Dartmouth offered $1600. That meant $400 more than the 1910-11 salary. He felt that was too good to turn down. He accepted the Dartmouth offer.
>
> There were several reasons why Arthur and I left. Arthur keenly felt the loss of Newson. They would have done research together. Arthur needed stimulus of other researchers. Ashton might have gone on with research but Arthur was not sure. Arthur and Mitchell were good friends. Arthur wanted to remain friends. There would probably always be rivalry for position in the department. The fact that Dartmouth was a good school coupled with a better pay had a big influence on Arthur's decision. Arthur was thirty years old. He felt very responsible for me. Rheumatic fever left him with a defective heart. He could not get life insurance.

The resignations of Young and Pitcher were a severe blow to the Department and to the University, but Chancellor Strong was not easily discouraged. The total effort made by him to provide a new head for the Department of Mathematics is not known. In particular, the dates of the resignations of Young and Pitcher are not known, and no record has been found to indicate that Chancellor Strong tried to get a new head for the academic year 1911-1912. The following letter, written by Strong to Professor Frank Morley at Johns Hopkins and dated May 13, 1912, shows, however, that the chancellor made at least one more effort to get a nationally prominent mathematician to head the Department of Mathematics.

> Will you kindly tell me as fully as possible in regard to Professor A. B. Coble, professor of mathematics in your university, for the position of headship of our department of mathematics. The department is a large and important one in the University of Kansas and the position is one of the most influential ones in the University. The salary of full professors at the University of Kansas at present is $2500 but I confidently expect that it will be increased considerably above that within the next two years,--I hope to $3000 and before long to $3500. Our Board of Regents is convinced of the necessity of an increase in the salaries of the University and will make every effort at the next session of the legislature to increase the budget for that purpose. We need a man who will be a competent leader of his department not only as a teacher and administrator but also as a man capable of some real constructive work in mathematics. We want to know particularly about his personal characteristics. The salary will seem low to a good man but it is probably correct to say that on it our full professors are able to live on a plane comparatively much higher than would be the case with like salaries in many other institutions.

Frank Strong reached high in his efforts to obtain a head for the Department of Mathematics. Frank Morley, to whom Strong had addressed his letter, was a distinguished mathematician. An Englishman, educated at King's College, Cambridge, Morley had taught at Haverford College and Johns Hopkins University; he was President of the American Mathematical Society during 1919-1920. Morley's complete biography and bibliography can be found in Archibald's *History of the American Mathematical Society* [Archibald 1, pp. 194-201].

A. B. Coble, the subject of Chancellor Strong's inquiry, was one of Morley's students and a distinguished mathematician. He was President of the American Mathematical Society during 1933 and 1934 and was elected to the National Academy of Sciences in 1924. A brief summary of his career may be found in the Sixth Edition (1938) of *American Men of Science* [S, Appendix IX, Coble]. Nothing is known concerning Morley's reply, but in any case Coble did not come to The University of Kansas. He was for many years Chairman of the Department of Mathematics at the University of Illinois.

The University's troubles, which had begun or were foreshadowed during 1910-1911, worsened as time went on. The most serious of these troubles--and it was probably related to most of the others--concerned the nature of the state's control of the University. As expected, the legislature established the single Board in 1913. An article entitled "One Salaried Board to be in Charge" in the February 1913 number of *The Graduate Magazine* describes the action of the legislature to abolish the Boards of Regents for the individual state schools, to establish instead "a State Board of Administration for the University of Kansas, the Kansas State Normal Schools, the Kansas State Agricultural College, the Kansas School for Deaf at Olathe, and the Kansas School for Blind at Kansas City, Kan., and to prescribe its duties. . .". The Board of Administration consisted of three persons nominated by the governor and approved by the senate; they were full-time paid employees of the state who received an annual salary of $3,500. The members of the Board of Administration were appointed immediately [*The Graduate Magazine* 13].

At the University, the results were quickly felt. The same page of *The Graduate Magazine* (March 1913) which named the members of the new Board of Administration, carried an announcement of the resignation of William Herbert Carruth to accept the "chair of comparative literature" at Stanford

University [Carruth 2]. Carruth began teaching in the University in 1879, and he received his B.A. in 1880. He received an A.B. in 1889 and a Ph.D. in 1893 from Harvard University. He became head of the K. U. Department of German in 1892 and vice-president of the faculties in 1902. Poet, author of the well-known poem "Each in His Own Tongue", and a great teacher, Carruth will always remain one of the University's most illustrious faculty members [Carruth 4]. Chancellor Strong was shocked and saddened by the loss of him. Carruth had spoken out strongly against "The Single Board of Regents" [Carruth 1], and he resigned as soon as it was established by the legislature.

The new Board of Administration began its work immediately. One of its first actions was to deny the ten percent salary increase promised the faculty by the former Board of Regents and for which the *funds had already been appropriated by the legislature* [*The Graduate Magazine* 12]. Even though the state was not very friendly to the University, this action by the Board of Administration is hard to understand. It illustrates, however, the fact that the new Board administered the University--as its name implied--, and that it was not a Board to establish policy. In the fall of 1913, the Board of Administration passed a regulation forbidding smoking in University buildings, and it requested that there be no smoking on the campus [*The Graduate Magazine* 15]. Mr. Edward T. Hackney, President of the Board of Administration, published an article entitled "An Inventory" in the March 1914 number of *The Graduate Magazine* [Hackney 1] which emphasized "State service" by the University once more. Mr. Hackney described the broadening scope of the University's work and the manner in which the University was serving the state; he stressed the enormous benefits bestowed by the University and the enormous sums saved for the citizens of Kansas. Mr. Hackney hoped to turn "State service" and its benefits for the State into financial profit for the University. In "An Inventory" he wrote, "The last legislature gave us an increase of appropriation, including fees appropriated, of $250,000 more than the University ever had before and by touching the citizens of Kansas at every point and offering something for the upbuilding of every citizen of the state and something of help in the solution of the problems of the citizens we hope to increase this appropriation very materially in the future and to overcome the objection heretofore urged against the University that it was only touching one in five hundred of the people of Kansas." In May 1914, the Board of Administration announced that it had adopted the following salary schedule [*The Graduate Magazine* 16]:

| | |
|---|---|
| Instructors | $ 600 - $1200 |
| Assistant Professors | $1200 - $1700 |
| Associate Professors | $1700 - $2200 |
| Full Professors | $2200 - $3000 |

The *Graduate Magazine* continued to report the actions of the Board of Administration. In May 1915, there was an announcement that the Board had removed Arvid Olin from his position as Dean of the School of Education and C. S. Skilton from his position as Dean of the School of Fine Arts [*The Graduate Magazine* 17]. A report in March 1916 [*The Graduate Magazine* 18] contains a copy of a letter sent to members of the faculties by Edward T. Hackney, President of the Board. Hackney's letter reports on a survey made by the Board to find out how much time each faculty member spends in the service of the state; the faculty had been accused of spending only three hours per day. According to Hackney's letter, the survey showed that each instructor "devotes 10 hours and 12 minutes per day to the service of the state, and we are especially pleased, also, at the splendid showing made as to the work done for outside activities such as Sunday Schools, duties as citizens, and things of that kind". These examples show how the administration of the University was taken over by the Board of Administration, and that this administration was often harsh and lacking in sympathetic understanding. Since all decisions were made by the Board of Administration, it is not clear what role Chancellor Strong played at this time. Griffin states that Chancellor Strong tried very hard to obtain another position so that he could leave the University [Griffin 1, p. 329].

In 1917 a change was made; a new Board of Administration relaxed somewhat the tight control of the campus [*The Graduate Magazine* 19].

> The State Board of Administration in charge of all penal, charitable, and educational institutions of Kansas, which succeeded the former board in charge merely of the state schools, is composed of the Governor, *ex officio*, E. W. Hoch, president, Wilbur N. Mason, formerly president of Baker University, and C. W. Green of Kansas City. They were appointed by Governor Capper last summer, taking office on July 1 (1917).
>
> Under the provisions of the new law the board has only general supervision, and the heads of the various institutions are more directly responsible for the internal management. Immediately upon its installation the board returned the business office of the University to its place in Fraser Hall, where it was located four years ago. Under the present plan all University business will be handled through the business office, and any department in the school may have a complete statement of its account whenever it wants one.

The new Board of Administration was more satisfactory to the extent that it had "only general supervision, and the heads of the various institutions are more directly responsible for the internal management", but it was less satisfactory because it was "in charge of all penal, charitable, and educational institutions of Kansas". On balance, however, the arrangement for the supervision of the state schools by the Board of Administration was most unsatisfactory. Furthermore, the governor was the *ex officio* Chairman of the Board of Administration, and it was possible for him to appoint the other three members from his own political party.

An article in *The Graduate Magazine* in March 1924 [*The Graduate Magazine* 26] contains an analysis of a *Survey of the State Institutions of Higher Learning in Kansas*, made in 1923 by the U.S. Bureau of Education, Washington. Fred Ellsworth has described the circumstances that led to this survey [Ellsworth 2, part I. p. 5].

> Gov. Henry J. Allen and his board, of whom H. J. Penny was the active leader in 1921, wrote John J. Tigert, then U. S. commissioner of education, to request a survey and recommendations for administration of the Kansas state schools. The commissioner agreed to provide such a service and appointed George F. Zook, then a specialist in higher education in the Federal Bureau of Education in the Department of Interior, Dr. L. D. Coffman, then president of the University of Minnesota and Dean A. R. Mann of the College of Agriculture at Cornell. Their report came out in May 1922, and was given wide publicity.

This survey had much to say about the Kansas "State Board of Administration" law which it found to be very unsatisfactory, and the survey predicted that sooner or later there would be trouble. The survey recommended a Board of Regents made up of non-salaried members appointed for terms of seven to nine years; this Board should have from seven to nine members, and its only responsibility should be the state's educational institutions. Ellsworth's articles [Ellsworth 2] are required reading for anyone who wishes to understand the political difficulties suffered by the University during the era of the Board of Administration. During the latter part of this period the Ku Klux Klan replaced the People's Party as the source of much of the trouble.

The trouble predicted in the report of the Bureau of Education survey was not long in coming. In December 1924, the Board of Administration consisted of Governor Jonathan M. Davis, chairman, and three others--at least two of whom were the governor's political appointees. There had been trouble and political interference (both John Shea, superintendent of buildings and grounds, and Dr. M. T. Sudler, Dean of the School of Medicine, had been dismissed from their positions by the Board) throughout Davis' term as governor, and finally, in December 1924, under the leadership of Governor Davis, the Board dismissed Lindley from his position as Chancellor. As a matter of principle, Lindley determined to fight his ouster. He sought an injunction in the court of District Judge Hugh Means, restraining the Governor and the Board from putting the dismissal into effect, but the injunction was denied on January 5, 1925. The Supreme Court upheld the district court's ruling in a decision on January 10, 1925. The courts had decided that the Board of Administration had the legal authority to remove the chancellor, and the chancellor was out. Governor Paulen was inaugurated on January 12, 1925, and his first action was to call the Board of Administration together and to instruct them to reinstate Lindley. That action was taken by the Board on January 13, 1925; Chancellor Lindley was out of office for only three days [*The Graduate Magazine* 28; Ellsworth 2, part I; Taft 1, p. 127].

This episode brought the era of the Board of Administration to an end. An article in the March 1925 number of *The Graduate Magazine* describes the law passed by the legislature which established a Board of Regents to control the state's educational institutions. The new Board of Regents, almost identical with the one recommended in the U. S. Bureau of Education survey of higher education in Kansas, replaced the former Board of Administration. Fred Ellsworth, in part II of his article [Ellsworth 2], has described in detail the actions of the legislature, and the difficulties it encountered, in establishing the new Board of Regents. The law passed by the legislature to establish the Board of Regents was reported promptly to the faculty and alumni [*The Graduate Magazine* 27]. A complete history of the state's management and supervision of the state schools through the various Boards of Regents and Boards of Administration has been given by Robert Taft [Taft 1, pp. 127-130].

One result of the state's mismanagement of the University through the legislature and the Board of Administration was a low salary scale which gradually deprived the University of a quality faculty. As early as 1912-1913 *The Graduate Magazine* carried a series of articles by McClung, Kellogg, and others who reported on the disastrous effects of low salaries [*The Graduate Magazine* 14]. In his report to Chancellor Strong dated April 15, 1916, Dean Templin protested the low salary scale in the College, not only because salaries were low but also because the College was treated unfairly with respect to the rest of the University [Templin 5].

There is ample evidence that the salaries were low. Consider, for example, the salary of F. O. Marvin for 1879-1880 and 1880-1881. As stated in chapter 1, the *Journal of the Board of Regents* records that when in 1879 F. O. Marvin was elected Assistant Professor of Mathematics, Physics, and Civil Engineering, his salary was $1050 per year. When Marvin was reappointed in 1880, his salary was $1200. In 1913 Solomon Lefschetz joined the staff of the department. Lefschetz's qualifications, in terms of education and experience, were better than those of F. O. Marvin, and Lefschetz eventually rose much higher than Marvin: Lefschetz received the Bordin Prize of the French Academy in 1919 and the National Medal of Science from President Johnson in 1964. Nevertheless, Lefschetz was appointed an instructor at a salary of $1200 for each of the years 1913-1914, 1914-1915, and 1915-1916. In spite of a nationally rising salary scale, salaries in the Department had not increased over a period of thirty-five years.

Chancellor Strong himself complained in the strongest possible terms about the University's low salaries. *The Graduate Magazine* for December 1918 published an extract from Chancellor Strong's biennial report to the Board of Administration in which he pointed out that the University's salary scale had been low for years, but that the situation recently had become much worse because of the war. The cost of living had increased considerably, and salaries in most of the nation had been increased accordingly--but not at The University of Kansas. Chancellor Strong cited examples in which faculty members had more than doubled their salaries by taking positions in other universities and in business. The following paragraph, which appears in italics in the article, sums up the substance and tone of Strong's report.

> We have been accustomed to say for years that higher salaries at the University are imperative. If there were a more emphatic word than imperative it would be used here. It is impossible for us to contemplate with equanimity the gradual disintegration of the institution because of the lack of reasonable and just pecuniary return for work performed. The real basis of dissatisfaction here is that the teachers and the administration of the institution are not getting a square deal. All administrative and teachers' salaries must at once be adjusted to present conditions.

There is other evidence to support the University's complaints to the Board of Administration and the legislature that its salary scale was too low. Many members of the faculty resigned to accept better positions elsewhere, especially in professional and business pursuits [Nelson 1]. One of the most notable of these was Erasmus Haworth, whose letter of resignation, addressed to Chancellor Strong, was published as follows in the March 1920 number of *The Graduate*

*Magazine* [Haworth 1].

Calling to mind a letter I sent you some fifteen months ago relative to my resigning from the faculties of the University, I beg to bring the matter before you again, and to say that it seems to me now is a proper time for me formally to present to you my resignation, with a request that it be granted to take effect June 30, this year.

Last year when I wrote you we were in the midst of the great world war, Dr. Haynes of our faculty was then with the American army in Europe, and we all felt it was likely others might be called at most any time. It seemed then that a resignation to take effect at once would not be for the best interest of the Department of Geology and Mineralogy. But now matters are different; Dr. Haynes has returned to the University; other members have been added to the Departmental faculty, and in every way the department is in a flourishing condition, with an enrollment this semester of about 700 students, the largest number of college and graduate rank ever enrolled at any one time in any American University, I believe.

Still another point, entirely personal, has influence with me at this time. If I am ever to give up my position here before entirely incapacitated with age it would seem the part of wisdom to do so while I am still healthy and vigorous, in order that I may in some way join the great world of industry with a fair hope of being able yet to gain a modest competency for old age before it is too late.

This brings me to the real and only cause for my resignation. During my student days, undergraduate and graduate, the thought never occurred to me seriously but that should I join the ranks of teachers and investigators, and do my duty reasonably well, I would be able to receive a sufficient remuneration so that I could live and raise and educate a family with reasonable respectability, and still be able to save a small amount sufficient for comfort in old age. I now see that had I given proper study to the experience of others I might have concluded differently, for I now know that teachers have been noted for their lack of financial competency in old age ever since we have had teachers.

The above is true, not only of the ordinary teacher, but likewise of the investigator of nature, the scientist, at whose door rightfully belongs a great part of credit for substantially all the wonderful material progress of the world throughout the last century. To the University professor who in addition to his work as a teacher, found time to investigate nature is due almost all discoveries upon which our modern intellectual, social and industrial life is based. And yet scarcely one of these men has ever been placed so that late in life he was not most concerned for the actual necessities of bodily comfort and sustenance for himself and dependent family.

> The present is neither the time nor the place for a discussion of the question as to whether or not society is doing her duty to this class of her citizens. But I wish to express to you, Mr. Chancellor, that this is the real cause for my handing you my resignation at this time. It is not that I do not have a desirable place in the world, for mine has been better than the average for a University professor. It is not that I cannot and have not been assured of fair success in my life work; for I am happy beyond my ability to express in the knowledge that many of my boys who have specialized under me have been unusually successful in the great business and industrial world, and that today they are scattered literally all over the world in following the activities for which they were specially trained in our University.
>
> Permit me, Mr. Chancellor, to express to you, and through you to my colleagues, a great appreciation of the many kindnesses shown me and my family personally, and a hope and and [sic] earnest desire that these pleasant and tender relations between us may live as long as we live, and further, that no matter what paths my feet may follow I shall always hold our University most dear and near to my heart, and shall always rejoice in her continued well doing.

Strong's reply shows how fully he understood the effects of the University's salary scale.

> Your letter of resignation under date of February 26th was duly received. I feel constrained to accept the same knowing how you feel about the matter and how long you have considered taking this step.
>
> I confess to a good deal of sadness at the thought of your leaving the University where you have worked so long. The men of the older time who have given such distinguished service to the University and have been so instrumental in giving it its present high standing are but few in number now and they are rapidly withdrawing from active service.
>
> You have reason to be proud of your record and you have left behind as a monument of your investigative work the very important reports of the State Geological Survey. It is fortunate for the University and the State that you have been able so effectively to round out this work.
>
> I appreciate fully the financial situation which has operated strongly in your case and affects so greatly the whole body of University teachers. It is a situation against which we have fought with all our might for many years but to very

> little purpose. No one yet knows certainly whether public communities will ever awake to the danger arising from the great body of college teachers whose important work you so well outlined in your letter withdrawing from a service so vital to the effectiveness and moral standing of the next generation. No one yet knows whether they will awake to the dangerous situation arising from a long and continued sense of injustice on the part of the great body of teachers throughout our country. The effect of all this upon the radical tendencies of the present day is too evident to need explanation.
>
> I thank you very sincerely for the great work you have done for the University and the State. I wish to thank you also for the many acts of personal courtesy and good will beginning with the arrival of Mrs. Strong and myself in Lawrence in 1902. With very best wishes for your success. . . .

Haworth was obviously bitter, and Strong accepted his resignation with "a good deal of sadness".

Fred Ellsworth, writing in 1964 [Ellsworth 2, part I], has described the salary situation as follows.

> When Dr. Lindley was invited to Kansas in 1920 to take the Chancellorship of the University, he agreed to accept the position on condition that two steps be taken promptly. One was a substantial improvement in faculty salary scales; the other was a change in the administrative system of the five state institutions of higher education. The faculty salary effort still goes on, although the relative salary position of Kansas faculty members is by no means in the pitiful situation it was then.

Just how pitiful the situation was then is shown by the salary figures in the report of the *Survey of the State Institutions of Higher Learning in Kansas*, prepared by the U. S. Bureau of Education in 1923. One of Chancellor Lindley's reports [Lindley 1] in *The Graduate Magazine* of December 1924 quotes these salary figures; there is also a table which shows a comparison with university salaries at Illinois, Iowa, Minnesota, Nebraska, Ohio State, and Oklahoma.

Kansas salaries were 22 percent below the average for professors, 21 percent below the average for associate professors, 15 percent below the average for assistant professors, and 9 percent below the average for instructors. The low salary scale made deterioration of the faculty inevitable.

The legislature denied the University funds for buildings as well as for salaries. As stated already, Chancellor Strong was highly successful at the beginning of his administration in obtaining funds for new buildings. Green Hall, Robinson Gymnasium, Marvin Hall, the Mechanical and Hydraulic Laboratories, and Haworth Hall had been completed by 1909, and plans had been developed for an imposing administration building (the present Strong Hall) [Templin 8]. The east wing of Strong Hall was completed in 1911, but then the building program came to a halt. In the spring of 1911 the legislature cut the University's appropriation for buildings, providing only "the appropriation of $42,500 for the foundation of the second section of the Administration building, and $7,500 for a clay working laboratory". The foundations for the central section of Strong Hall were constructed, but they remained bare and useless for about five years. The legislature made no appropriations for buildings in 1915, and the chancellor complained bitterly: "Eight years without buildings for classrooms, in a growing institution which during that period will have increased its enrollment a thousand!" [Strong 10]. There is a chart in volume 13 of *The Graduate Magazine* (opposite page 203) which shows the increase in enrollment of the University and the funds for buildings tabulated year by year. This chart shows that the enrollment increased from 1233 in 1901-1902 to 2801 in 1914-1915, but that the legislature provided no building funds for the eight years from 1909 to 1917. Finally, the west wing and a part of the central section of Strong Hall were completed in 1918; six sections of the stadium were completed in 1921, the necessary funds having been obtained from gifts of students, alumni, and friends; the Electrical Engineering Laboratory and the power plant were completed in 1921; and, finally, the central section of Strong Hall was completed in 1923. Twelve years elapsed between the completion of the east wing and the completion of the central section of Strong Hall. And the completed building was much less magnificent than Olin Templin's original design [Templin 8]. *The Graduate Magazine* and Taft's *Across the Years on Mount Oread* contain many photographs of Strong Hall in various stages of construction.

The University sought escape from the financial difficulties caused by its dependence on the legislature's uncertain biennial appropriations: a strong campaign was mounted to secure a mill tax to provide a permanent and stable income for the University. A number of states had such a mill tax, and *The Graduate Magazine*, as early as 1910-1911 (volume 9), launched a campaign to obtain a mill levy for the support of the educational institutions in Kansas. The campaign for the mill tax continued to be pressed in articles in volume 11 (1912-1913) of *The Graduate Magazine*; there was a simultaneous campaign to obtain a women's dormitory for the University [*The Graduate Magazine* 10]. Henry Earle Riggs, '86, writing as the President of the K. U. Alumni Association, published a forthright statement of the needs and difficulties of the University in the November 1917 number of *The Graduate Magazine* [Distinguished Graduates of K. U. 10]. Riggs made a strong statement about the University's need for more income, more faculty, more salary for the faculty, and more buildings. He emphasized the need for a proposed constitutional amendment which would permit the legislature to levy the mill tax and provide a permanent income for the University. The campaign for the mill tax is probably the best example of the lobbies conducted by the University; Riggs announced that the Alumni Association was supporting the lobby for the mill tax with all the force at its command. And this lobby was successful: the last cover page of the November 1918 number of *The Graduate Magazine* displayed the following announcement [*The Graduate Magazine* 24].

A New Day

> The voters of Kansas have proved their appreciation of higher education by adopting the following amendment to the constitution: "The legislature may levy a permanent tax for the use and benefit of the state educational institutions and *apportion among and appropriate the same to the several institutions*, which levy, apportionment and appropriation shall continue until changed by statute."

But the victory proved hollow: at no time did the legislature take advantage of this authorization and actually levy a mill tax for the benefit of the educational institutions of the state.

The financing of the state schools in Kansas has been made more difficult by the fact that, for many years, an unusually large number of its high school graduates have gone to college. The front cover page of *The Graduate Magazine* for January 1913 reported on this problem [*The Graduate Magazine* 22]:

> For every 100,000 inhabitants, New York has fewer than 200 young men and women in colleges and universities. Illinois has 230, Wisconsin 300, and Kansas 760, of whom more than half are in the state institutions. Kansas believes in spending money for education because Kansas knows that money put into education is invested where dividends are sure.

Furthermore, the legislature passed a law in 1915 which prevented the University from restricting its enrollment; this law still stands as the statement of the University's admission requirements. In 1917 Chancellor Strong called attention to this law and its significance for the University in one of his reports in *The Graduate Magazine* [Strong 11].

> A new and unprecedented situation which tends to increase the number of students at the University of Kansas may have escaped the attention of the alumni. The Legislature of Kansas in 1915 (perhaps the first of all the states) passed a law to the effect that the graduates of four year high schools in Kansas accredited by the state board of education, should by fact of their graduation be admitted to the institutions of higher learning in the state. Visitation and inspection of high schools was withdrawn from all the state institutions and placed in the office of the state superintendent of public instruction. The University therefore has no control over its requirements for entrance except through the fact that the Chancellor of the University is a member of the State Board of Education which accredits high schools.

The University was plagued by troubles from 1910 to 1925: mismanagement by the Board of Administration, rapidly increasing enrollments, a shortage of faculty, a low salary scale, and a shortage of buildings. In addition, however, Chancellor Strong had a faculty that was restless, resigning because of low salaries, upset by World War I, concerned over the status of the profession, and, finally, almost in open revolt over their failure to gain satisfactory participation in the government of the University. The origin of the movement for faculty participation in university government is unknown, but an event that foretold coming changes occurred immediately after the resignation of J. W. Young as Head of the Department of Mathematics. Beginning with the academic year 1911-1912 the Department had a Chairman rather than a Head Professor. A report dated March 18, 1914, which Professor John Nicholas Van der Vries submitted to Dean Templin [contained in the Report of the Department of Mathematics for 1913-1914], states:

> The department of mathematics is now completing its third year of management on a departmental basis. It believes that it has proven that such a system is a working one, and that the department under it has done the work belonging to its field in an effective and successful manner. The department has worked harmoniously no matter to whom the chairmanship has been entrusted. The department believes that its condition is healthful and that it has not only maintained but constantly raised its own standards.

The new form of management was also called the "committee system," because the work was carried on by numerous committees. This form of departmental management was not restricted to mathematics alone; the Report of the Department of Mathematics for 1914-1915 contains a letter to Professor Van der Vries which refers to the German Department's continuation of the committee system. The committee system was accompanied, at least in the beginning, by the democratic procedure in which a department elected its own chairman. In a letter dated May 29, 1915, contained in the Report of the Department of Mathematics for 1914-1915, Chancellor Strong reminded Professor Van der Vries that "this method of selecting the chairman will be subject to change in case the new constitution is adopted". An article published in *The Graduate Magazine* for December 1915 describes the new constitution to which Strong referred and gives its history [*The Graduate Magazine* 30].

> Any alumnus reading the new constitution with a seeing eye would find it an admirable document. The system which it sets forth satisfies fairly well the rather common human desire for participation in the labors and satisfactions of administrative work, and thus it furthers professorial contentment. It provides against clashes of authority, and thus reduces frictional discomforts to that irreducible minimum which is probably as small in a University as in any other human institution of equal size. It marks the highways of procedure--and not only the highways but the crossroads--and thus saves waste of time. It introduces flexibility in some of the higher administrative positions which

> are somewhat in danger of being taken too seriously.
> The constitution was prepared by a committee of the faculty which devoted numberless afternoons and evenings, in the fall of 1912, to reducing practice to precept and preparing new rules governing new practices. After its adoption by the University council--now known as the senate--it received the approval of the Chancellor and was presented to the Board of Regents. But the Board of Regents was at that time engaged in passing into history--and took no action. The new Board of Administration, busily occupied with more pressing matters, was not urged to take immediate action on the constitution and the final approval was given only recently.

The tenure of faculty members and administrative officers was outlined in the constitution.

> Professors and associate professors are on permanent appointment. Assistant professors are on one year appointment for the first two years, after which, if satisfactory, their appointment is permanent. Instructors are on one year appointment unless otherwise definitely provided.
> The titles and functions of such administrative offices as head professor, director of a division, Dean and Vice President, being commonly held in addition to those of professorship, may be transferred from time to time from one professor to another as the interests of the work may demand.

As suggested by Chancellor Strong's letter, the constitution did not provide for the election of departmental chairmen. Instead, "the appointment of head professors of departments is made on the joint recommendation of the Deans of the Schools in which the professor is expected to give instruction, approved by the Chancellor". The constitution further stated that "all teachers, except head professors, are appointed on the joint recommendation of the head of the departments concerned, the Deans of the Schools in which the appointee is expected to teach, approved by the Chancellor".

The October 1916 number of *The Graduate Magazine* contains "The Report of the Dean of the College", dated April 15, 1916, addressed to Chancellor Frank Strong. This report begins, "In conformity to the constitution of the University, I submit herewith my report as Dean of the College of Liberal Arts and Sciences for the year 1915-1916". Dean Templin, in this report, asked for more faculty, more buildings, more and better equipment, and a higher salary scale for all ranks. He called attention to the fact that the enrollment in the College of Liberal Arts and Sciences had increased much more than in other parts of the University and stated, "I am confident that an investigation will show that *the College has not participated equitably* in the income of the University as it is devoted to instructional purposes". The "non-negotiable demand" had not yet been invented, but blunt language and protests were the order of the day. For example, Dean Templin, in his report to Chancellor Strong, said, "I cannot leave this subject without submitting a protest against the apparent disposition to pay higher salaries to the faculties of the technical schools than to the College". But how can you keep the faculty quiet when the Dean talks that way to the Chancellor! As for the new constitution, however, Dean Templin gave complete approval in his report.

> The adoption of the new constitution for the University has contributed immensely to the smooth working of internal affairs. The location of responsibility and the definite assignment of duty have banished much perplexity and promoted harmony and cooperation.
>
> This constitution provides two forms of departmental organization, that under a head professor and the committee plan with a chairman as executive. Success has attended the experiments of the substitution of the committee form for the department administered by a head professor. In this our experience is in line with that of many of the best universities. With the committee organization responsibilities and duties are distributed among the members of the department; those in the lower ranks have more influence in the determination of departmental policies; often serious personal embarrassments are avoided; the deterioration of departments by the incapacity of the ruling head to keep step with

> progress in subject matter or method; the refusal of choice men to accept appointment to the ranks with a head of doubtful ability or temper over them--these are some of the advantages attained by the adoption of the more modern form of faculty organization. It is my opinion that as vacancies in headships occur they should be filled by the substitution of chairmen as provided by the constitution.

But the faculty was not satisfied with the participation gained in the government of the University, and it pressed for more. An article entitled "A New Committee" in the December 1918 number of *The Graduate Magazine* begins as follows. "The budget committee of the College was lately created by the adoption of the following motion: that the faculty of the College approve the committee system in making the budget for the College, [and] that the faculty proceed to elect from the ranks of full professors a Budget committee of six members for the coming year . . . ." By this time faculty participation in university government had become a major issue. Professor David L. Patterson, Professor of European History and Assistant Dean of the College, published an article entitled "Growth of Democracy in University and College Administration" in the April 1919 number of *The Graduate Magazine*. The preface to this article explains that in November 1917, the senate had elected a committee--with the chancellor as chairman--to revise the constitution of the University. Because of the uncertainties and disorganization caused by World War I, the committee never met. Early in 1919, however, at the request of Chancellor Strong, eight additional members were added to the committee, and it was renamed the Commission on the Reorganization of the University. A meeting of this Commission was called on April 14, 1919, to revise the constitution which had been adopted by the senate and approved by the Board of Administration in November 1915. There is no record, however, that this revision was ever completed.

The Alumni Association had appointed a Board of Visitors to visit the campus and to make recommendations about the operation of the University. The Board of Visitors submitted its report--a frank, critical, and comprehensive review--in two parts [*The Graduate Magazine* 20, 21]. The first part of the report echoed some of the faculty's complaints, added the Board's own criticisms, and advised against the addition of unnecessary departments and programs of State service, warning that "'State service' is a siren song luring to disaster". The second part of the report of the Board of Visitors states:

> In common with many other citizens of the state your committee feels a keen sense of humiliation in the fact that there are in France and scattered about the United States a number of former faculty members of the University and of the Agricultural College, who are still waiting for two months salary due them for services rendered in July and August, 1917. It is humiliating that the great state of Kansas should be placed in this position.

Individuals, as well as members of the Board of Visitors, criticized the situation at the University (see [Taft 1, p. 115]). Mrs. Helen Perry Edwards, '96, a member of the Board of Visitors, published an article entitled "What's the Matter with Kansas?" in the May 1919 number of *The Graduate Magazine* [*The Graduate Magazine* 25]. Mrs. Edwards acknowledged that something is wrong with Kansas, and she tried to define the trouble. She concluded that the University was placing too much emphasis on scholarship and not enough on teaching and the development of character: the University had lost the Kansas spirit, a spirit made up of democracy, courage, honesty, sturdy integrity, and a clear vision of things as they are and should be, undimmed by false ideals of success.

Fred Ellsworth described the end of Chancellor Strong's administration thus [Ellsworth 1, part III, p. 11]:

> In 1917 came the World War. A sensitive man, Dr. Strong was troubled to see the progress of the University impeded. He grieved to read every casualty list, particularly if the names of K. U. men or women appeared. He gave generously to war work, and urged the faculty members to do likewise.
>
> At the same time, faculty committees began to rise up and assume authority in the affairs of the University, which confused the administration. Dr. Strong asked to be relieved of the chancellorship as soon as the Governor and the Board of Administration could find a replacement. That was done by 1920.
>
> And the former Chancellor became a professor of law.

Chancellor Strong announced his resignation on September 12, 1919 [Taft 1, p. 116], and in a letter published in October of that year [Strong 13] which also described the accomplishments of his administration. Chancellor Strong, in his report on his administration, stated the following.

> In most respects the responsibility for the increase in the field of work of the University is a joint responsibility. In regard to the addition of certain schools and departments, however, I am directly and almost solely responsible. These are: the Summer Session, the School of Medicine, the School of Education, the Extension Division, the department of journalism, and the department of home economics. I felt the importance of these to be so great for the future of the University that I was under obligation to assume executive responsibility in their establishment. After this was done I had in the main the support of the administrative officers and faculties of the University and especially the Board of Regents.

Perhaps such actions and statements offended those faculty members who were pressing for democracy in University administration; it is impossible to know. In any case, Chancellor Strong's resignation did not stop the campaign; instead, it erupted with renewed fury. In January 1920, C. F. Nelson published an article entitled "Problems of Democracy in University Administration" [Nelson 1]. An article by Professor U. G. Mitchell in the February 1920 number of *The*

*Graduate Magazine* describes efforts to establish student self government at The University of Kansas [Mitchell 1].

An article entitled "About University Professors", written by President Nicholas Murray Butler of Columbia University, in the February 1920 number of *The Graduate Magazine*, emphasizes another of the reasons for the restlessness of university faculties at the close of World War I. The faculty of The University of Kansas had legitimate complaints about low salaries and other matters, but in addition it was aware that the position of the university professor was undergoing change--change accelerated by World War I. The K. U. faculty feared that, as a result of this change and for a variety of local reasons, it was losing status. President Butler described the changing world of the university professor [*The Graduate Magazine* 31].

> The most significant thing that has happened to the university teacher during the past decade is the number and variety of contacts that he has established with the practical affairs of life. These contacts were once confined to the teacher of law, of medicine, or of engineering. They are now shared by pretty much all types of university teacher. When a specialist in the Zend Avesta and in the philosophy of the Parsees is sent halfway round the world to plan relief for the suffering population of Persia, when a professor of psychology is entrusted with the task of framing a plan for the selection of officers for the United States Army, when a professor of electro-magnets is set to hunting the submarine in association with the officers of the United States Navy, when a professor of physiography is first sent for to aid the General Staff in forming a plan of military operations on the field of battle and then is set to deciding where the boundary line between two reconstituted nations shall run, the universities are getting pretty closely in touch with the practical events of the time. Moreover, the world at large is showing a new respect for men who have spent years in scholarly discipline and association. The President of the United States was for a quarter of a century a teacher of history and political science in three colleges; the President of the Council in France once taught his native language and its literature to a group of American students at Stamford, Connecticut; the Prime Minister of Italy holds the chair of economics in the University of Naples; the first President of the Czechoslovak Republic is the most

> eminent teacher of philosophy among his people; one university professor has just resigned as American Minister to China and another is still serving as American Minister to Greece; and so it goes through other European countries and in the South American Republics. The fact of the matter is that the university teacher has some time since ceased to belong to a class apart, to an isolated group leading a life carefully protected and hedged about from contact with the world of affairs. The university teacher is everywhere as adviser, as guide, as administrator; and as his personal service extends over a constantly widening field, so his influence marks the increasing interpretation of the university and practical life. Indeed, there is no better training in practical affairs than that which the business of a modern university affords.

In March 1920, *The Graduate Magazine* published an article entitled "A Californian on College Democracy" [McMurry 1]; this article, reprinted from the *California Alumni Fortnightly*, shows that agitation over democracy in the universities was nationwide. Finally, in April 1920, Dean Templin published in *The Graduate Magazine* an article entitled "The Chancellor to Be" [Templin 11]. Dean Templin acknowledged that there was trouble when he said, "Some friction has developed between the faculty and the administration, as it has developed between the student body and the faculty" (p. 188). Furthermore, Dean Templin criticized much that had been written and proposed; he wrote (page 190):

> Much is said about the method of appointment to faculty positions, promotions in the ranks, and the fixing of salaries. "Self determination", it is insisted, would secure and retain better men and women in the faculty, and would make them more contented and therefore more efficient. But such experiments as have been made with this method of making appointments to the faculty and the fixing of salaries have not borne out the theory.

But many in the faculty felt that Templin had struck a foul blow when he wrote: "The truth is that the proposed plan of complete control by the faculty is not democracy, at all. It is simple socialism."

Dean Templin's article drew critical and almost violent replies in the May 1920 number of *The Graduate Magazine* from three veteran members of the faculty--three of Dean Templin's friends who were normally quiet and peaceful. R. D. O'Leary, Professor of English, in a strongly worded article which was highly critical of Dean Templin, admitted that he was unable to say what would be required to make the faculty more contented [O'Leary 3]. F. H. Hodder, Professor of History, wrote a letter supporting the development of democracy in American universities and criticizing Dean Templin and his article [Hodder 2]. Professor Hodder wrote:

> That democracy in no way militates against executive power is evidenced by the fact that the American president is the most powerful executive in the world. What is proposed is that executives shall share the exercises of power with their faculties and legislative power includes a voice in the apportionment of the funds available for university purposes.

E. H. Hollands, Professor of Philosophy, also wrote a letter in support of university democracy and critical of Dean Templin [Hollands 1]. The June 1920 number of *The Graduate Magazine* also contained three letters which continued the controversy aroused by Dean Templin's article. Dean Templin was severely criticized, at least by the faculty, for his support of a strong University administration; perhaps it is significant that Chancellor Strong was never criticized by name nor identified as the object of the faculty's wrath.

The controversy--almost a faculty revolt--finally disappeared, at least from public view. Ernest K. Lindley became chancellor in the fall of 1920 [Taft 1; Ellsworth 1, part IV], after Frank Strong resigned and became a

Professor of Law in the University's Law School [Strong 13]. Olin Templin resigned as Dean of the College of Liberal Arts and Sciences; perhaps he remembered how Frank Strong, as a newly arrived chancellor, had removed Ephraim Miller from the position; but perhaps he was exhausted by the controversy over university democracy as well as by seventeen years as Dean of the College, Professor of Philosophy, promoter of the Alumni Association and *The Graduate Magazine*, and assistant to Herbert Hoover in the Federal Food Administration in Washington during World War I [Templin 14]. Templin had not completed his service to the University, however. The November 1920 number of *The Graduate Magazine* describes a reorganization of the Endowment Association in which Lindley became President and Templin became Secretary [Templin 10]. Templin devoted the remainder of his life to the Endowment Association with remarkable success. The year 1920-1921 began with a vigorous campaign to raise one million dollars to build a stadium and a student union building as a memorial to the University students killed in World War I [Taft 1, pp. 130-132; *The Graduate Magazine* 32].

The preceding lengthy account of events in the University will serve as a background for viewing the history of the Department of Mathematics during the troubled period from 1910 to 1925. Many changes took place, beginning in 1911. In that year John Wesley Young resigned and went to Dartmouth College. It is not known what efforts Chancellor Strong may have made to obtain a head professor to replace Young, but in any case the Department had a chairman rather than a head professor beginning with the year 1911-1912. This information is contained in the Report of the Department of Mathematics for 1913-1914, the first of five existing volumes, each of which contains rather complete and comprehensive reports on departmental activities for one year. In a report to Dean Templin dated March 18, 1914, Professor Van der Vries wrote: "The department of mathematics is now completing its third year of management on a departmental basis. . . . The department has worked harmoniously no matter to whom the chairmanship has been entrusted." These statements verify that the Department went under "management on a departmental basis" or the "committee system" in the fall of 1911, and they strongly imply that more than one person had been chairman during the three years from 1911 to 1914. Professor Van der Vries was the senior member of the staff, but the University catalog for 1911-1912 states that he was on leave during the second semester. *The Graduate Magazine* reports that he went to the South for his health; his illness resulted from a cold he had contracted in St. Louis some weeks before while attending the annual meeting of the Southwestern Section of the American Mathematical Society [*The Graduate Magazine* 33]. Thus, there certainly was more than one chairman between 1911 and 1914; the fact that Professor Van der Vries was *elected* chairman for 1913-1914 and for several later years suggests that the Department elected its chairman beginning in 1911. (The Department's committee system of departmental management will be explained in full detail later in this chapter.)

A second change in 1911 provided new and better offices and facilities for mathematics. The east wing of Strong Hall was completed and occupied in 1911; the University catalog for 1913-1914 states:

> The east wing of the College of Liberal Arts and Sciences and Administration Building which, when completed, will cost $500,000, was erected in 1911, and is now occupied by the departments of economics, history and political science, mathematics, philosophy, and sociology; the psychological laboratories occupy the basement, and the department of drawing and painting the third floor. The foundation for the central section of the building is in course of construction.

The new building provided space for both offices and a departmental library. The 1911-1912 University catalog states that J. N. Van der Vries, C. H. Ashton, H. E. Jordan, and J. J. Wheeler had offices in 108 Marvin Hall, and that the other members of the mathematics staff--U. G. Mitchell, M. B. White, H. H. MacGregor, J. O. Hassler, and A. L. Nelson--had offices in 111 Administration Building. Since the numbering of the rooms in Strong Hall has changed, it is immpossible today to identify the room then designated as 111. The new building also provided a departmental library for mathematics and philosophy. The University catalog for 1911-1912 states that the University had eleven departmental libraries "placed in close conjunction with the various laboratories and lecture rooms. . . ". The 1914-1915 University catalog states that there is a combined mathematics library (with about 2000 volumes) and philosophical library (with about 2700 volumes) in the Administration Building. *The Graduate Magazine* had already published, in October 1913, a description and a photograph of the Mathematics and Philosophy Library [*The Graduate Magazine* 34]. From this information it is possible to determine that this library was located in the present room 103, Strong Hall.

There was one other significant change in September 1911; it was, unfortunately, a familiar one: more than half of the staff again was new; that is, more than half of the 1911-1912 staff members had not taught in the Department in 1910-1911.

Staff of the Department of Mathematics

1911-1912

John Nicholas Van der Vries, Associate Professor of Mathematics
108 Marvin Hall — 1644 New Hampshire Street
Charles Hamilton Ashton, Associate Professor of Mathematics
108 Marvin Hall — 1202 Ohio Street

Ulysses Grant Mitchell, Assistant Professor of Mathematics
111 Administration Building
(Miss) Marion Ballantyne White, Assistant Professor of Mathematics
111 Administration Building
Herbert E. Jordan, A.B. 1900, A.M., 1901 (McMasters University, Toronto); Ph.D., 1904 (University of Chicago). Assistant Professor of Mathematics, 1911.
108 Marvin Hall 1600 Kentucky Street
Arthur Bowes Frizell, Instructor in Mathematics
108 Marvin Hall
Jasper Ole Hassler, A.B. (William Jewell). Instructor in Mathematics, 1911.
111 Administration Building 725 Missouri Street
Hazel Hope MacGregor, A.B. 1906 (Yankton College); A.M., 1909 (University of Illinois). Instructor in Mathematics, 1911.
111 Administration Building 1845 Tennessee Street
Alfred Lewis Nelson [appointed for the second semester, 1911-1912] A.B., 1911 (Midland College). Instructor in Mathematics, 1912.
111 Administration Building 940 Indiana Street
John Jefferson Wheeler, A.B. 1905 (Indiana University); A.M. 1913 (University of Kansas). Professor of Mathematics, Friends, 1905-1911; Instructor in Mathematics, Kansas, 1911.
108 Marvin Hall 1240 Rhode Island Street

The *American Men of Science* biographies of Herbert E. Jordan (Sixth Edition, 1938), Jasper O. Hassler (Sixth Edition, 1938), and Alfred L. Nelson (Ninth Edition, 1955) appear in Appendix IX of the Supplemental Volume.

## 1912-1913

John Nicholas Van der Vries, Associate Professor of Mathematics
Charles Hamilton Ashton, Associate Professor of Mathematics
Ulysses Grant Mitchell, Assistant Professor of Mathematics
Marion Ballantyne White, Assistant Professor of Mathematics
Herbert Edwin Jordan, Assistant Professor of Mathematics
Edmund Pendleton Randolph Duval, B.S., 1901 (University of Texas); A.M., 1904 (Harvard). Assistant Professor of Mathematics, 1912.
108 Marvin Hall 1609 Tennessee Street
Hazel Hope MacGregor, Instructor in Mathematics
John Jefferson Wheeler, Instructor in Mathematics

Assistant Professor Duval was the only new member of the staff in 1912-1913. He is entitled to a place in history because he was the joint author, with Professor Maxime Bocher of Harvard University, of the widely known and widely used Bocher's *Introduction to Higher Algebra* (prepared for publication with the cooperation of E. P. R. Duval), New York, 1907, xi + 321 pp.; reprinted fourteen times, last in 1937. This book was translated into both German and Russian [Archibald 1, p. 166]. Professor Duval had been a student at Harvard, and he assisted Professor Bocher by writing up the notes of Bocher's lectures. I met Professor Duval in Norman, Oklahoma, in the spring of 1938, and we spoke of his contribution to the writing of Professor Bocher's book. (Professor Duval's biography from the Sixth Edition, 1938, of *American Men of Science* appears in Appendix IX of the Supplemental Volume.)

## 1913-1914

John Nicholas Van der Vries, Associate Professor of Mathematics
Charles Hamilton Ashton, Associate Professor of Mathematics
Ulysses Grant Mitchell, Assistant Professor of Mathematics
Marion Ballantyne White, Assistant Professor of Mathematics
Herbert Edwin Jordan, Assistant Professor of Mathematics
Edmund Pendleton Randolph Duval, Assistant Professor of Mathematics
John Jefferson Wheeler, Instructor in Mathematics
Solomon Lefschetz, Instructor in Mathematics
    108 Marvin Hall                937 Missouri Street
Hermon Henry Conwell, Instructor in Mathematics
    111 Administration Building    832 Kentucky Street

One of the new staff members in 1913-1914 was Professor Solomon Lefschetz, certainly the most distinguished mathematician the Department has ever had on its staff. (Lefschetz's biography from the Eleventh Edition, 1966, of *American Men of Science* appears in Appendix IX of the Supplemental Volume.) The other new member of the staff in 1913 was Professor Conwell, later Dean Conwell.

(His biography from the Sixth Edition, 1938, of *American Men of Science* also appears in Appendix IX.)

Although the staff had nine members in 1913-1914 and also in 1914-1915, there were changes. The Department's records state that, as a result of "the resignation of Professor Duval and the departure of Miss White", there were two new staff members--Carus and Stouffer--in 1914-1915. The records also state that E. B. Stouffer was appointed in Miss White's place.

1914-1915

Professor Van der Vries (Promotion)
Associate Professor Ashton
Assistant Professor Mitchell
Assistant Professor Stouffer (New appointment)
Assistant Professor Jordan
Instructor Wheeler
Instructor Lefschetz
Instructor Conwell
Edward Hegeler Carus, Instructor in Mathematics.
B.S. Wisconsin, 1912. Present position, 1914-.

Edward Hegeler Carus was a member of a prominent Illinois family: his father had written several mathematics books and his brother was a mining engineer and executive. Although Carus did not follow a career in mathematics, he did obtain a Ph.D. degree from the University of Chicago in the year 1921-1922. The title of his thesis was "Invariants as products: a vector interpretation of the symbolic method" (see *American Mathematical Monthly*, vol. 30 [1923], p. 404). On October 26, 1914, E. H. Carus gave a paper to the Mathematics Club of The University of Kansas with the following title: "Addition and subtraction applied to geometry according to the principles of Grassmann" (see *American Mathematical Monthly*, vol. 25 [1918], p. 450). In 1919, the *American*

*Mathematical Monthly* carried an announcement of E. H. Carus' father's death and a sketch of his work (vol. 26, p. 135):

> Dr. Paul Carus, editor and manager of the *Open Court* and *The Monist* at La Salle, Illinois, died on February 11, 1919, in the sixty-seventh year of his age. He was a very prolific writer. Among his books are: *The Foundation of Mathematics*, 1908, and *The Principle of Relativity in the Light of the Philosophy of Science*, 1913. He also wrote some chapters in *Magic Squares and Cubes* by W. S. Andrews, 1908.

Announcements of a gift to the Mathematical Association of America that led to the establishment of the Carus Monograph series and details about the early history of these monographs can be found in *American Mathematical Monthly*, vol. 28 (1921), pp. 352-354; vol. 30 (1923), pp. 151-155; and vol. 31 (1924), p. 410.

The other new member of the staff in 1914-1915 was Ellis Bagley Stouffer. For forty-one years, from the time he entered the Department in 1914 until the time he retired in 1955, Stouffer played a major role in the Department of Mathematics and in the University as a whole. He spent the remainder of his life in Lawrence and died there on November 24, 1965. (His biography from the Ninth Edition, 1955, of *American Men of Science* appears in Appendix IX.)

## 1915-1916

Professor Van der Vries
Professor Ashton (Promotion)
Associate Professor Mitchell (Promotion)
Assistant Professor Stouffer
Assistant Professor Jordan
Instructor Wheeler
Instructor Lefschetz

Karl John Holzinger, Instructor of Mathematics.
A.B., Minnesota, 1915. Present position, 1915-.
Arthur William Larsen, Instructor of Mathematics.
A.B., Wisconsin, 1913; A.M. Wisconsin, 1915. Assistant, Department of Mathematics, University of Wisconsin, 1914-1915. Present position, 1915-.
Leonard Leo Steimley, Instructor of Mathematics.
A.B., Indiana, 1912; A.M., Indiana, 1913. Present position, 1915-.

(The biography of Karl John Holzinger from the Sixth Edition, 1938, of *American Men of Science* appears in Appendix IX.)

## 1916-1917

Professor Van der Vries
Professor Ashton
Associate Professor Mitchell
Assistant Professor Stouffer
Assistant Professor Jordan
Assistant Professor Wheeler (Promotion)
Assistant Professor Lefschetz (Promotion)
Instructor Larsen
Instructor Steimley
Earle Brenneman Miller, Instructor of Mathematics.
A.B., Colorado, 1914; A.M., Chicago, 1916. Present position, 1916-.

## 1917-1918

Professor Van der Vries (Absent for war work during the second semester)
Professor Ashton
Associate Professor Mitchell
Associate Professor Stouffer (Promotion)
Assistant Professor Jordan
Assistant Professor Wheeler
Assistant Professor Lefschetz
Instructor Miller
Instructor Larsen

The year 1917-1918 is noteworthy because it is the first year for many, many years in which there was no new member of the staff. Also, World War I reduced the size of the staff and influenced the work of the Department in ways which will be described later. (A biography of Earle Brenneman Miller taken from the Sixth Edition, 1938, of *American Men of Science* appears in Appendix IX.)

I have already mentioned five volumes of Mathematics Department records for the years 1913-1914 through 1917-1918. These reports summarize the Department's academic activities and correspondence, and provide intimate and detailed accounts of the staff during one of the turbulent periods in the University's history. A review of these five Reports of the Department of Mathematics will now be given.

The Department's reports provide, first of all, an account of how the Department obtained its chairman. The evidence suggests, as recounted above, that the Department elected its chairman during 1911-1912 and 1912-1913. The report for 1913-1914 states: "In September, 1913, the department perfected the following organization: Chairman, J. N. Van der Vries; Secretary, J. J. Wheeler." There follows a list of committee and other assignments. Van der Vries and Wheeler were chairman and secretary, respectively, from 1913-1914 through 1917-1918, but they held these positions on an annual basis. The word "perfected" clearly means that the Department elected its chairman and secretary. The report for 1914-1915 states that "the department met on October 2, 1914, and in pursuance to notification from Chancellor Strong perfected the following organization for the year. . . ". Van der Vries and Wheeler were elected again. The "notification from Chancellor Strong" was Strong's letter of July 9, 1914 (cited earlier), authorizing the Department to "continue upon the committee system of management". As described above, Strong's letter of May 29, 1915, to Professor Van der Vries requested the Department to elect its chairman for 1915-1916.

The 1915-1916 report states that this election took place on June 4, 1915. The new University constitution was approved in November 1915, and it did not authorize departments to elect their chairmen. The report for 1916-1917 contains a June 1916 letter from Chancellor Strong to Professor Van der Vries, informing him of his appointment as chairman of the Department of Mathematics for the coming year. The report also states that the Department met on September 28, 1916, and organized its committees. Although it is not mentioned, Wheeler was elected departmental secretary.

In 1917, the Board of Administration was modified, and much of the internal control of the University was returned to Chancellor Strong. The chairmanship of the Department for 1917-1918 first went, by Chancellor Strong's appointment, to Professor Van der Vries. But in January 1918, Van der Vries asked for a six-month to one-year leave of absence to do war-related work. In writing to Strong, Van der Vries explained:

> The President of the United States has asked the Chamber of Commerce of the United States to assist him in coordinating the business interests of this country for the better and more efficient conduct of the work and in preparing the country for the work of reconstruction which will follow the close of the war. The Chamber of Commerce has asked me to assist in the great increase of work which will devolve on it in carrying out this task. The exact line of work can be explained only after further developments.

In a separate letter to Chancellor Strong, Professor Van der Vries reminded him that it would be necessary to appoint someone to assume the duties of chairman of the Department. Consequently, Chancellor Strong wrote to Professor Ashton in late January 1918 to inform him of his appointment as chairman for the remainder of the academic year. Ashton's temporary appointment proved to be permanent:

he continued as chairman of the Department until 1931. The records do not indicate when the appointment was made permanent; in reality, however, all chairmen of the Department of Mathematics received permanent appointments (except as limited by the retirement age of sixty-five) from 1918 to 1970.

During each of the five years 1913-1914 through 1917-1918, the Department assigned Professor J. N. Van der Vries to be in charge of work in the Graduate School and College, Professor C. H. Ashton to be in charge of work in the School of Engineering, and Professor U. G. Mitchell to be in charge of work in the School of Education and in the Oread Training School. In addition the Department had six committees as follows: schedule and catalog, text books, library and apparatus, teachers' recommendations, census and records, and special examination. It is not clear whether these committees were elected by the Department or appointed by the chairman. It seems likely, however, that most assignments were decided by general agreement, and that junior staff members were assigned where they might be needed on less important committees. Each supervising official and each committee prepared an annual report on its activities, which was included in the bound departmental report for the year.

The Committee on Schedule and Catalog, as the name implies, prepared the schedule of courses (including times) to be offered each semester and assigned instructors. Throughout the five years covered by the reports, the membership of this committee consisted of Ashton, Mitchell, and Van der Vries. The Committee on Text Books selected text books, at least for elementary courses. During 1913-1914, it consisted of Mitchell, Ashton, and Duval; during the remaining four years, Stouffer replaced Duval. The Committee on Library and Apparatus was responsible for the selection and ordering of books and journals for the mathematics library. The record does not indicate that any apparatus (mathematical models, telescope, or mathematical instruments) was bought during this period. During the year 1913-1914 the committee consisted of Van der Vries, Lefschetz, and Jordan; during the remaining four years, Stouffer replaced Jordan. The evidence indicates that Dean Stouffer bore the burden of the clerical work involved in ordering books and journals after he joined the committee in 1914, although Van der Vries and Lefschetz gave valuable help in selecting the items to be bought. The Committee on Recommendations of Teachers operated as a teacher placement bureau to assist graduates of the University in obtaining teaching positions in secondary schools, usually in Kansas or adjoining states. Professor Mitchell was the chairman and permanent member of this committee. He was assisted during the first year by Miss White, during the next three years by Van der Vries and Ashton, and during the fifth year by Stouffer. The Committee on Census and Records prepared detailed reports, semester by semester, on the students enrolled in the Department's courses, and also prepared inventories of the Department's mathematical models and equipment. Professor Jordan was the permanent member of this committee. He was assisted by White and Conwell the first year, by Conwell and Duecker the second year, by Larsen and Steimley the third and fourth years, and by Miller the fifth year. Professor Jordan did not realize it perhaps, but he had received a permanent appointment to keep the Department's enrollment records; he did so until he retired many years later. He was careful and meticulous. An example of Professor Jordan's work on this committee is the eight-page inventory--typed by him--of the Department's mathematical models which is included in the 1913-1914 report. The responsibilities of the Committee on Special Examinations are indicated by its name. Professor Wheeler was the permanent member of the committee. He was assisted as follows: Duval, the first year; Jordan and Carus, second year; Holzinger, third year; Jordan and Miller, fourth year; and Miller, fifth year.

The 1914-1915 report contains the following statement submitted by Professor Van der Vries on work in the College.

> The action of the College Faculty in changing the rules in regard to majors necessitated a change in the statements at the beginning of the section of the college catalogue devoted to the outline of mathematics courses. As now stated, Courses 2-7, inclusive (viz., College Algebra, Trigonometry, Analytics I, Analytics II, Calculus I, Calculus II), Course 50 or 52 (viz., Analytic Mechanics or Advanced Calculus I), Course 55 (Higher Algebra I), Course 59 (Modern Geometry I) and Course 62 (History of Mathematics) are required of all students majoring in mathematics. The remainder of the 12 hours required in the list of courses open to juniors and seniors and of the 30 hours total may [be] chosen at the option of the student.
>
> The department is now offering solid geometry for college credit. During the second semester of the past year there were enrolled in it 13 college students and 26 engineering students. The action of the last legislature taking the fixing of entrance requirements out of the hands of the university and placing it in the office of the state superintendent will in time force the department to offer for college credit the third one-half year of high school algebra as it has the third one-half year of high school geometry. The state superintendent has already stated to the registrar in writing that he expects to require one unit of high school algebra for entrance to the state university. The number of students coming with only two units of high school mathematics will therefore be on the increase, and among them (especially from the smaller schools) will be found more and more who desire to go on with mathematical study. The department should therefore at an early date discuss the general question of the advisability of the introduction for college credit of a course in what is now known as third term high school algebra.

The second paragraph of this report by Professor Van der Vries describes the Department's response to the law passed by the legislature in 1915 admitting to the University all "graduates of four year high schools in Kansas accredited by the state board of education" [Strong 11]. Professor Van der Vries' report clearly indicates that this legislative action caused the Department of Mathematics to offer a large number of sub-freshman and remedial mathematics courses--courses which it has continued to offer to the present day.

The report for 1916-1917 of Professor Van der Vries, Representative in Charge of the College, contains the following paragraph.

> All freshman sections in College Algebra and Trigonometry were placed under the supervision of Professor Stouffer in order that, without destroying the initiative and the freedom of the individual instructor, the student might be assured of equal preparation in the essentials for his future work.

Mathematics 10, originally entitled "Probability and Statistics", was offered for the first time in the spring semester of 1916. The title of the course was changed to "Mathematical Theory of Investments"; it treated the mathematical theory of investments and the theory of probability as applied to insurance. Because of increasing interest in courses in business mathematics, both in The University of Kansas and in other universities, the Department thought that it would soon be necessary to establish a course to teach the graphical representation of statistics and the determination of empirical equations.

The Department was divided into two parts, a College section and an Engineering section. Certain members of the staff were assigned to Engineering, with Professor Ashton in charge; those members of the staff had offices in room 108, Marvin Hall, and they taught separate courses for students in the School of Engineering. Professors Ashton, Jordan, Wheeler, Lefschetz, and some of the temporary instructors were assigned to Engineering during the years covered by the five departmental reports. Although the staff was thus divided in the assignment of work and in the location of offices, the Department insisted that it was a single Department, and the five reports supply convincing evidence that it operated as a single Department. The question of a division in the Department was mentioned only once; the report for 1913-1914 contains a letter, dated March 18, 1914, from Professor Van der Vries to Dean Templin which contains the following paragraph:

> The Department believes that the work of Professor Van der Vries and Professor Ashton entitle [sic] them to promotion to professorships. If any distinction in title is to be made, it believes that the work of Professor Ashton in organizing and supervising the work in the School of Engineering has qualified him for the position of Professor of Applied Mathematics, but with the distinct understanding that the latter appointment implies in no way a division in the department.

Professor Van der Vries subsequently was promoted to a Professorship on the basis of this recommendation (the Department's, but forwarded by himself); Professor Ashton, however, was not.

Professor Ashton, in his capacity as supervisor of the work in Engineering, reported that "in the spring of 1915 the members of the department teaching in the Engineering School decided to try a unified course for freshmen in algebra, trigonometry and analytics, using Schlichter's *Mathematical Analysis* as the basis of the course". The experiment was continued during 1915-1916, but abandoned thereafter. The staff felt that the "unified course" lacked flexibility, and especially that it made the placement of transfer students difficult. There was widespread experimentation with unified courses from 1915 to 1925, but they did not replace the separate courses in algebra, trigonometry, and analytic geometry. To cite another example of the experimentation, the first college course in mathematics that I took (in 1921-1922) was a unified course in algebra, trigonometry, and analytic geometry taught from a textbook entitled *Unified Mathematics* by Benedict, Calhoun, and Karpinski. After World War II, unified courses became almost universal; but algebra and trigonometry were combined in one course, and analytic geometry and calculus were combined in another sequence of courses.

The School of Education was established in 1909, and the Oread Training High School was organized in 1911. The latter had its classrooms in Myers Hall (built in 1906), a building erected through the agency of the Christian Church for Bible instruction. The new building of the Oread Training School was built during the summer of 1915; after World War II it became the Faculty Club. After the Club was disbanded, it housed first the offices of the Endowment Association and later the Office of University Relations. Taft has given an account [Taft 1, p. 107] of the School of Education and of the Oread Training High School:

> The School of Education had been formed in 1909 with the express purpose of giving professional training to prospective high-school teachers and administrators, although previous to the organization of the new school such training had been provided by a department of pedagogy within the College of Liberal Arts. One of the first developments of the School of Education was to establish Oread High School as a training school for observation and practice by prospective teachers. It served, in addition, as a high school which gave the usual training afforded by a secondary school.

Professor Mitchell taught courses in the teaching of mathematics and served as chairman of the department of mathematics in the Oread Training School. He selected textbooks, employed teachers, and supervised the practice teaching of students who were preparing to be secondary school teachers of mathematics. Professor Mitchell reported on an experiment in teaching a unified course in the last two years in the Oread Training School; the course was abandoned, the *First Year Mathematics* and *Second Year Mathematics* textbooks by E. R. Breslich being considered relatively unsatisfactory.

*The Graduate Magazine* for June 1903 reported on the opening of the first Summer Session as follows [*The Graduate Magazine* 40]: "The first summer session of the University, authorized by the Board of Regents at its January meeting, began on Thursday, June 11, under Director W. H. Carruth. The enrollment on June 20, had reached one hundred and nineteen. Twenty members of the faculty are engaged in the work of instruction." Single lectures and entire courses were given by visitors from other universities. The number of students was small for the size of the staff. The Summer Session prospered, however, and Professor Jordan's enrollment reports give the following information about the mathematics courses.

| Year | Number of Courses | Number of Instructors | Total Enrollment |
|---|---|---|---|
| 1914 | 8 | 4 | 89 |
| 1915 | 7 | 4 | 68 |
| 1916 | 7 | 4 | 53 |
| 1917 | 9 | 4 | 47 |
| 1918 | 11 | 4 | 68 |

In an effort to attract students, the Summer Session offered courses during a six-week term and a four-week term. The 1914-1915 report describes correspondence with teachers across the state in an effort to determine which courses would attract the largest number of students to the 1915 Summer Session. In a report dated March 18, 1914, which Professor Van der Vries submitted to Dean Templin, the Department boasted,

> The work in the Summer Session has been developed especially along advanced lines, so that it is now possible for teachers in High Schools and for the instructors in the colleges of this and other states to obtain their advanced degrees entirely by summer work, a situation in which the University of Kansas is not surpassed, if equalled, by any university west of Chicago. Four advanced courses of this kind are being offered in the summer session of 1914.

In the years following World War II, the Department was not able to offer a selection of courses in the Summer Session that would enable students to obtain even master's degrees by summer study alone.

The following letter from F. J. Kelly, Director of the Summer Session, to Department Heads in 1916 repeats the emphasis of Chancellor Strong and the Board of Administration on "State service". This letter also describes the problems which have made the organization and staffing of the Summer Session difficult even to the present day.

> Will you please submit on the enclosed blank form at your early convenience a list of courses and instructors recommended by your department for the summer session of 1917? Each instructor is expected to carry at least five hours of work during the six-weeks term and four hours during the four-weeks term. The same instructor cannot remain for both terms if he has been engaged in teaching during the past year.
>
> The demand for graduate work is increasing and we should meet the demand as adequately as possible. So also is the number of regular university students who remain for summer work increasing and their needs should be kept in mind. We must, of course, make ample provision for the high school and college teachers in our respective fields. Lastly, we hope to bring the University to an ever increasing number of those engaged in banking,

commerce, transportation, manufacturing, newspaper work, public life, social service, and many other occupations in which University courses are not commonly supposed to be definitely serviceable. If your department can make any appeal to this large class by its selection of courses, we hope it will do so.

The cost per student-hour of credit has been as follows:

| | 1914 | 1915 | 1916 | Avg. |
|---|---|---|---|---|
| Six-weeks term | \$5.78 | \$6.16 | \$5.32 | \$5.70 |
| Short term | \$3.43 | \$3.50 | \$2.87 | \$3.06 |

It will be noted from this that the demand in the four-weeks term is much larger than in the six-weeks term in proportion to the instruction offered. We hope to increase the opportunities of the short term materially next year. If your department has not been offering courses in the short term in the past and you think the demand will warrant their being offered next summer, we shall welcome your suggestions.

As far as the committee was able without consultation with the several departments, it canvassed the prospective demands which each department will probably have to meet next summer. Its proposal for a certain number of instructors in your department should not be considered final if in your judgment some other number either more or less would be better.

The next table below shows the Department's load of instruction during the five years covered by the reports. Professor Jordan gives a table which contains the figures in the total column.

Student Hours Per Week of Instruction

| | First Semester | Second Semester | Total |
|---|---|---|---|
| 1911-1912 | ---- | 1557 | ---- |
| 1912-1913 | 2130 | 1591 | 3721 |
| 1913-1914 | 2209 | 1988 | 4190 |
| 1914-1915 | 2560 | 2168 | 4728 |
| 1915-1916 | 2510 | 2050 | 4501 |
| 1916-1917 | 2640 | 2449 | 5186 |
| 1917-1918 | 2374 | 2054 | 4428 |

There are some discrepancies, because the figures for the two semesters do not add up to the total in some cases; nevertheless, the table shows approximately the Department's load. Then, as now, the load of instruction was always heavier during the first semester than during the second.

A report dated September 29, 1915, states that "the number of hours taught by each member of the department is: Van der Vries-14, Ashton-13, Mitchell-13, Stouffer-10, Jordan-15, Wheeler-15, Lefschetz-15, Steimley-14, Larsen-15, Holzinger-12." Footnotes explain that Mitchell was "devoting part time to Oread School", and that Stouffer was "devoting part time to astronomy". Professor Stouffer received $200 in addition to his salary from the Department of Mathematics for teaching astronomy during 1915-1916; he received a similar bonus for teaching astronomy the next year. Enrollment reports show that all advanced classes were small, and that an elementary class with more than twenty-five students was rare.

The Mathematics Club was a prominent feature of the work of the Department for many years, and the five reports tell much about its activities. The report for 1915-1916 contains a copy of the printed program of the Mathematics Club for that year; this program lists the officers and members and gives the speaker and the title of his paper for each of the meetings during the year. This program tells us that "the club was organized in December, 1911", and that it "meets every second and fourth Monday each month at 4:30 in the Administration Building". The scope of the club's activities is indicated by the following report, part of Professor Van der Vries' College report in the 1915-1916 departmental report.

> The mathematics club had a membership of 26. Professor Stouffer acted as advisor during the year. 15 regular meetings

and a picnic were held during the year. The club also gave a reception to its returning members at commencement time. An excellent program was given, a copy of which as well as of the list of officers can be found on pages 49-50. A picture of the club was presented to the department and may be found in Room 112, Administration Bldg.

The club finished the fifth year of its existence. During that time, it has had a total of 82 members. Of these one has received the degree of Ph. D. at Chicago University, three more have completed the requirements with a few exceptions for such degree. Sixteen members of the club have received the degree of Master of Arts, and of this number seven are working towards their Ph. D. degree. Sixteen members are engaged in college and university teaching, whereas forty-one are engaged in high school work.

Professor Raymond Clare Archibald edited a section of the *American Mathematical Monthly* entitled "Undergraduate Mathematics Clubs" [Archibald 2], and his accounts indicate that similar mathematics clubs were widespread and a major activity of mathematics departments. Archibald's reports indicate that the club at The University of Kansas was typical of many throughout the nation. Printed programs of the year's activities were common. Archibald gave the complete programs (speakers and titles of talks) of the Mathematics Club in the K. U. department for the four years 1914-1915 through 1917-1918. Professors Mitchell, Van der Vries, Stouffer, and others served as faculty advisor for the club, but over the years Professor Mitchell was its patron saint. The Mathematics Club frequently sponsored a fall and a spring picnic. The club prospered until after World War II, when it declined under the pressure of competition from the Department's graduate seminars and colloquia and the advanced graduate program generally. A problem that the Department has not solved is how to maintain an active and thriving undergraduate mathematics club in the midst of an advanced graduate program.

The report for 1914-1915 describes the efforts of the Department and others in the state to organize an association of college teachers of mathematics. The preliminary work in the spring of 1915 led to a meeting in Topeka in November 1915, where a group was organized that later became the Kansas Section of the Mathematical Association of America. The MAA itself was organized at Columbus, Ohio in December 1915. Professor Mitchell was the delegate of the Kansas group, the first body to apply for admission as a section of the Association. The national MAA had 1028 charter members, of whom 37 were from Kansas and 12 were from The University of Kansas. The Kansas Section of the MAA held its first meeting (as such) at The University of Kansas on March 18, 1916; a report of this meeting appeared in the *American Mathematical Monthly* [*American Mathematical Monthly* 1]. The page opposite this report shows a group photograph of those who attended the March 18, 1916 meeting. The following summary of all these activities was included in Professor Van der Vries' report for 1915-1916.

> The department took a very prominent part in the foundation not only of the Kansas section of the Mathematical Association of America but also in the foundation of the national organization itself.
>
> Eight members of the department were present at the formation of the Kansas section in Topeka in November, 1915. The second meeting of the section was held at The University of Kansas in March, 1916. At this meeting, the Kansas section affiliated with the national association, the first section to do so. A picture of this section meeting . . . was published in *The Mathematical Monthly*, an honor awarded to no other section. Professor Van der Vries presented a paper on "Geometry for College Juniors and Seniors," which paper will appear shortly in *The Mathematical Monthly*.
>
> Professor Mitchell was present as a delegate of the at the [sic] formation of the National Mathematical Association of America in Columbus, Ohio, December, 1915. He is a member of the editorial staff of the Monthly and is in charge of the department "Questions and Discussions." Professor Van der Vries was elected a member of the executive council of the association at the Columbus meeting.
>
> Three members of the department, Professors Van der Vries, Mitchell and Stouffer were present at the first summer meeting of the Mathematical Association held at the Mass. Inst. of Technology, Sept. 1 and 2, 1916. At this meeting, Professor Van der Vries presented one of the four papers on the program, his paper being on "Unified Courses in Mathematics for College Freshmen." An

abstract of this paper appears in the October number of *The Mathematical Monthly*.

Contributions by Professor Mitchell have appeared on pages 31, 91, 123 of Volume XXII and pages 181 and 221 of Vol. XXIII of *The Mathematical Monthly*, and a review on page 250 of Vol. XXIII.

The department was represented at the St. Louis meeting of the Southwest Section of The American Mathematical Society in Nov. 1916, by Professor Van der Vries, and at the summer meeting of The American Mathematical Society, Sept. 4, 5, 1916, at Cambridge, Mass., by Professors Mitchell and Stouffer. Professor Van der Vries was present the day prior to the meeting but was called away before the meeting was opened.

A paper by Professor E. B. Stouffer in the December, 1915, number of *The Proceedings of The London Mathematical Society* was on the subject "Seminvariants of Linear Homogeneous Differential Equations."

Papers by Professor Lefschetz have appeared during the year as follows:

"The Arithmetic Genus of an Algebraic Manifold Immersed in Another" in the June,1916, *Annals of Mathematics*.

"Note on the n-dimensional cycles of an algebraic n-dimensional variety" in the July,1915, *Rendiconti del Circolo Matematico di Palermo*.

"On Cubic Surfaces and Their Nodes" in the March,1916, *Kansas Science Bulletin*.

A paper by Mr. Steimley on "The Solution of Linear Non-homogeneous Partial Differential Equations" appeared in the October number of the *American Journal of Mathematics*.

The report for 1916-1917 describes other outside activities of the staff. The annual meeting of the Southwestern Section of the American Mathematical Society was held in Lawrence on December 2, 1916; twenty-three members of the Society from six states were present. Professor Stouffer presented one paper and Professor Lefschetz two papers at this meeting. Professors Stouffer and Lefschetz each presented one paper by title at the 1917 spring meeting of the Chicago Section of the American Mathematical Society. Professors Van der Vries and Ashton represented the Department at the annual meetings of the American Mathematical Society and the Mathematical Association of America in New York during the 1916-1917 holidays. Professor Stouffer attended the summer meetings of the AMS and MAA in Cleveland in September 1917, and gave a paper entitled

"Geometry for College Juniors and Seniors" on the MAA program. During the year Professor Van der Vries published a paper on a course on geometry and an abstract on combined courses in the *American Mathematical Monthly*; Professor Mitchell edited a section of the *Monthly* and published there a discussion of the training of teachers of mathematics; and Professor Lefschetz published four research papers--one in Italy, one in France, one in England, and one in the *Kansas University Science Bulletin*. Activities in other years were similar to those that have been described.

The five volumes of reports describe the strenuous efforts of the Department to build up its mathematics library. The library appropriations for the five years were the following: 1913-1914 ($480), 1914-1915 ($448), 1915-1916 ($500), 1916-1917 ($500), and 1917-1918 ($400). The report for 1913-1914 states that the mathematics library had complete files of eighteen journals, and that it was a paid subscriber to twenty-four journals (the two sets were not disjoint). No information was given about journals received through exchanges, but tradition states that the mathematics library profited from exchanging the *Kansas University Science Bulletin* for mathematics journals as a result of the publication of Newson's *Theory of Collineations* in volume 6. A majority of the important books and journals in mathematics were published in Europe during the first part of the century, and World War I interfered seriously with the Department's efforts to build its library. The records of orders in the reports for 1914-1915 through 1917-1918 prove (I know the handwriting!) that Professor Stouffer must be counted among those who built the mathematics library. Further information about the library is contained in records from four of the reports for 1914-1915 through 1917-1918. The 1914-1915 report states, All of the volumes ordered by the department during the year 1913-1914 were received with one exception, viz., *Elements de la Theorie des Integrals Abeliennes*, par M. Tikhomadritzki. Of the journals, *Acta Mathematica*, *Annals of Mathematics*, and *Rendiconti di Palermo* are still lacking a few numbers.

The amount apportioned to the department of mathematics for the year 1914-1915 for library purposes was $448.00. There were ordered during the year on recommendation of the library committee a total of 301 volumes, including in addition to individual volumes and sets of complete works,

a) A complete set of *Annales Scientifiques de l'Ecole Normale Sup'e*,
b) Series 1, 1836-55, *Journal de Mathematiques, Pures et Appliques*,
c) Series 1 and 2 (82 Vol's.) *Journal de l'Ecole Polytechnique*.

Of the 301 volumes, 90 have arrived and the remainder are still "*in statu quo*." There was left in the department fund on June 3, 1915 a balance of $471.00, all of it, however, covered by outstanding orders. . . . There was great fear that this sum would revert to the state, June 30, 1915, it being the end of the biennium. The matter was taken up with the Board of Administration with the result that special action was taken by them. . . June 23, 1915 ordering the library balance to be carried over after July 1, 1915. The department therefore has at the present time in addition to its appropriation for the current year sufficient funds to cover all outstanding orders made during the 1913-15 biennium.

Only a partial apportionment of library funds has been made for the year 1915-16. The whole matter of apportionment has been placed in the hands of a committee, of which Professor Millis is chairman.

The 1915-1916 departmental report states that

Of the volumes ordered by the department during the year 1913-14 six have arrived during the past year. There remain two volumes which are still due.

Of the volumes ordered during the year 1914-15 twenty-three (23) have arrived during the past year. There are still due forty-five (45) which were ordered during this period.

During the past year the department has had at its disposal $500.00. The committee has had numerous meetings and has studied the matter carefully. One hundred seventy nine (179) volumes have been ordered. Of these only 44 have arrived. The above figures are here given to show the difficulty which the committee is experiencing in the expenditure of its funds on account of the war.

The committee has made a special effort to improve the library along the lines of mechanics and applied mathematics.

The 1916-1917 report of the Department of Mathematics again complains about the problem of securing books that have been ordered.

The situation abroad is causing the same difficulty in the expenditure of library funds as has been the case since Aug. 1914. The committee on library has labored industriously and ordered a total of 265 volumes. The sum at the disposal of the department was $500.00 in addition to the surplus from the previous year. It is difficult to state the exact status of the departmental exchequer at the present time. No money was lost however at the end of the 1915-17 biennium as an adjustment is made prior to the end of the biennium between those departments which have overdrawn and those which have a balance, the respective budgets of the departments being readjusted after the new biennium is entered upon. Two books ordered during the year 1915-16 appeared during the past year, but no outstanding orders of previous years have been filled during the past year and may be considered as cancelled. . . . The department is urged to see that all desired books in the English and French languages are purchased during the present situation and should hand the names of such books to the library committee at once.

The 1917-1918 report of the mathematics library committee states:

There have been ordered during the year 1917-18 a total of 138 books with an expenditure of approximately $386.00. Of these books 27 have arrived. All orders previous to the year 1915-16 have been duplicated or may be considered as cancelled. In the following table there is given the number of books not yet received from orders of the past three years and the approximate amount involved in these orders.

| Year | No. Books | Value |
|---|---|---|
| 1915-16 | 87 | $206.00 |
| 1916-17 | 122 | 242.00 |
| 1917-18 | 121 | 342.00 |
| Total | 330 | 890.00 |

A count of the volumes in the library on June 2, 1917 showed a total of 1942 and a similar count on May 28, 1918 showed a total of 2040, a gain of 98. These figures do not include unbound volumes. During the year one volume was lost, a copy of Cajori's *History of Mathematics*.

The state of the Department's graduate program during the five years covered by these reports is indicated by the courses offered, the degrees granted, and the success of its graduates. Enrollment reports show that the following courses were actually taught during the five years 1913-1918 (only courses which follow the elementary courses in calculus are listed):

Differential Equations
Series
Advanced Calculus I, II
Teachers Course
Complex Numbers
Engineering Mathematics
History of Mathematics
Analytic Mechanics
Theory of Numbers
Modern Geometry I, II
Theory of Higher Plane Curves
Higher Algebra I, II
Theory of Functions of a Complex Variable
Elliptic Integrals
Theory of Finite Groups
Galois Theory
Fourier Series
Projective Geometry I, II
Projective Differential Geometry I, II
Mathematics Reading (Lefschetz)
Thesis

In 1913-1914 the Department awarded three master's degrees; the recipients and their thesis titles were F. E. Wood, "Coordinante Systems in One and Two Dimensions", Earl Thompson, "The Development of the Teaching of Algebra in the United States", and Ella E. Bernstorf. In lieu of a thesis, Miss Bernstorf presented five extra hours of credit, a total of thirty-five hours. The Department was proud to report that during 1914-1915 four of its graduates held fellowships in other universities. They were Ray E. Gilman, Princeton University, Edwin Frank Wood, Princeton University, Clarence McCormick, Clark University, and Alfred L. Nelson, University of Chicago. The Department was pleased also that three of its own graduate students held fellowships during 1914-1915. The Department awarded its own fellowship to Ottilia W. Duecker, and two fellowship holders from Kansas colleges elected to do graduate work in mathematics. They were Miss Ethel Mallonee from Fairmount College and Mr. Cyril Arthur Nelson from Midland College.

In June 1915, the Department awarded four master's degrees: Miss Ottilia W. Duecker, "On the Projective Differential Geometry of Cubic Ruled Surfaces" (thesis supervisor: Professor Stouffer); Mr. Charles F. Green, "On the Seminvariants of Linear Homogeneous Differential Equations of the Third Order" (thesis supervisor: Professor Stouffer); Mr. H. H. Conwell, "A Special Riemann Surface with Application to the Hyper-Elliptic Case" (thesis supervisor: Professor Lefschetz); and Miss Ethel Mallonee, "Plane Roulette Curves" (thesis supervisor: Professor Mitchell).

In September 1915, the Department reported that Ray E. Gilman held a fellowship at Princeton University; Frank Edwin Wood, at Princeton University; Clarence McCormick, at Clark University; and that Mr. Charles F. Green held a graduate assistantship at the University of Illinois. Moreover, Mr. H. H. Conwell had accepted an assistant professorship at the University of Idaho for 1915-1916. That year, for the first time, the Graduate School awarded two fellowships to students in mathematics; they were Miss Jessie M. Jacobs from MacPherson College and Mr. Cyril Arthur Nelson from Midland College. The Department began 1915-1916 with two holders of fellowships from Kansas colleges:

Miss Ada West from Midland College and Mr. Paul W. Harnley from MacPherson College. Also, Miss Eva L. Trimble of Cooper College and Miss Ida Maude Arnett of The University of Kansas were in residence working towards M.A. degrees.

The number of enrollments of graduate students in the different courses of the Department during 1915-1916 was forty (with a total of 97 student-hours) during the first semester and thirty-seven (with a total of 104 student-hours) the second semester. This large enrollment resulted from the fact that the Department had two University fellowships, two Kansas college fellowships, and three additional graduate students--a total of seven graduate students in addition to the members of the instructional staff who were taking graduate work.

The Department awarded master's degrees in June 1916 to Ellen Jane Eaton, "Geometry of the Quadrangle" (thesis supervisor: Professor Mitchell); Paul W. Harnley, "Some Properties of Inscribed Quadrilaterals" (thesis supervisor: Professor Mitchell); Jessie M. Jacobs, "The Riemann Surface for the Function $w^2 = z^3 + 3z + 2$" (thesis supervisor: Professor Ashton); Cyril A. Nelson, "Hessians and Steinerians of Plane Quartic Curves" (thesis supervisor: Professor Van der Vries); and Eva L. Trimble, "Set of Problems of the Circle Arranged by Type Form" (thesis supervisor: Professor Lefschetz).

For the year 1916-1917, the Department reported that Charles F. Green held an assistantship at the University of Illinois; that Jessie M. Jacobs held a graduate assistantship at the University of Illinois; and that Cyril A. Nelson held a fellowship at Princeton University. In addition, the Department reported that Ray E. Gilman received a Ph.D. degree from Princeton University in June 1916, and accepted an instructorship at Cornell University for 1916-1917. Also, for the year 1916-1917, F. E. Wood accepted an instructorship at Northwestern University and Clarence McCormick accepted an instructorship at the

University of Minnesota.

The committee on fellowships of The University of Kansas awarded fellowships for 1916-1917 to Jessie M. Jacobs (A.M. University of Kansas, 1916) and to Ada West (A.B. Midland College, 1915). Miss Jacobs was later released to accept a graduate assistantship at the University of Illinois.

Professor Van der Vries completed the 1916-1917 report on the Graduate School as follows.

> The enrollment in the Graduate School was smaller than any for a number of years. The department was unfortunate in the fact that no holders of state college fellowships elected to take their work for the master's degree in the department of mathematics. In addition to Miss Ada West, the holder of a university fellowship in mathematics, there was only one graduate student, viz., Miss Eva Stoll. The degree of A. M. was granted at the June, 1917 commencement to Miss West, the subject of her thesis being "The Projective Differential Properties of Exponential Curves."
>
> Since my last report Miss Maude Arnett completed the requirements for the degree of A. M., the subject of her thesis being "A Problem on the Triangle." She was however classified as belonging to the class of 1916.
>
> The department should carefully consider the question of the requirement of a thesis for the A. M. degree, also the question of differentiating between those who take up graduate work after having completed the departmental major or its equivalent as an undergraduate and those who have not. Students of the latter kind are only equipped to write a thesis along some educational or historical or similar line, and it is therefore a question whether or not some distinction should be made in the degree awarded.

The United States had now entered World War I, and the plans of many mathematicians were changed. In October 1917, Professor Van der Vries reported the new locations or positions of four of those who had received master's degrees from the Department. F. E. Wood was now Professor of Mathematics at the University of New Mexico in Albuquerque; Paul Harnley was Principal and

Professor of Mathematics at Campbell Junior College in Holton, Kansas; Ray E. Gilman was an artillery Captain in the U.S. Army; and Jessie M. Jacobs was a Fellow in Mathematics at the University of Illinois.

The author begs the reader's indulgence for a digression on Professor Ray E. Gilman. I knew Professor Gilman well, first at Brown University during 1936-1937 and later during 1944-1945 when we were both operations analysts engaged in operations research studies at Headquarters Eighth Air Force in England [S, Appendix VIII]. In the closing days of World War II, I made a recruiting trip from Washington to Providence; I persuaded Professor Gilman to go to the Pacific for operations research work with the Air Force to end the Japanese war, but the war ended before either of us left the country. Professor Gilman, always light-hearted, told two stories that are worth repeating about his student days in Lawrence.

The wind blows hard in Kansas in the spring, and it is especially strong across the ridge of Mount Oread. In the days when skirts were long and full, the young ladies sometimes found walking difficult. Professor Gilman said that as he was walking across the campus one spring day, a great gust of wind picked up a student on the other side of the street and blew her across. As she neared him, however, he was able to reach up and pull her down to earth again. A picture in *The Graduate Magazine* [*The Graduate Magazine* 36; also 35, p. 10] which shows young women in crinolines trying to reach Old North College in a high wind lends credence to Professor Gilman's story.

Fourteenth Street is always steep; and when it is covered with clear ice, it is dangerously slick. Once on an icy day, a student slipped at the top of Fourteenth Street, his feet shot forward from under him, and he gained momentum as he slid rapidly downward. He soon scooped up a young lady who had preceded him, and together they proceeded to the bottom of Fourteenth Street. There, according to Professor Gilman, the student reached up, touched his cap, and said, "Madam, you will have to walk from this point; this is as far as I go".

The year 1917-1918 was badly disrupted by World War I. Furthermore, Professor Van der Vries, who had been chairman of the Department since 1913, and probably since 1911, left the University on February 1, 1918, for a war-related leave of absence. As a result, the report for 1917-1918 is much less complete than the four earlier volumes; in particular, there is no report on graduate work during the year.

The five years spanned by the reports were a period in which "management on a departmental basis", or the "committee system", was being strongly promoted by its advocates. From the sources available to this writer, it has not been possible to trace the complete history of the "committee system" movement, but some information may be gleaned from University catalogs. The catalog for 1916-1917 is the first one which identifies either chairmen or head professors of departments. In that catalog it is possible to identify seven chairmen and fourteen head professors. Since the Department of Mathematics was certainly one of the early departments to operate under the "committee system", it will be instructive to examine its methods of operation to see how well it achieved the ideal state envisaged by advocates of university democracy.

One of the principal features of the committee system was the Department Meeting. At the first meeting each year, the Department completed its organization by electing the Chairman, if he had not been elected already or determined by some other procedure, and by establishing the Department's committees and making other assignments of responsibilities. The remaining Department Meetings were devoted to discussions of Department business or to colloquium-type talks on mathematics.

The report for 1913-1914 states that the Department held six regular meetings during the year. The regular business of the Department was transacted at these meetings; in addition, the staff discussed integral equations; papers on this subject were given by Professor Ashton, Professor (Miss) White, and Dr. Lefschetz.

The 1914-1915 report states that five department meetings were held during the year. Ashton gave a paper on Galois' theory at one of these meetings, and Stouffer gave a paper on differential geometry at another. At the October meeting, Professors Van der Vries, Ashton, and Mitchell were "appointed" a committee on budget and plans and were instructed to forward their recommendations to the proper university officials. At the November meeting, Professor Mitchell was elected the Kansas University representative on the editorial board of the *American Mathematical Monthly* for two years. The University of Kansas was one of the midwestern universities that subsidized the *Monthly* before it was taken over by the Mathematical Association of America as its official publication.

Six Department Meetings were held in 1915-1916 for the discussion of departmental matters and mathematics papers, but the report for that year does not describe any major decisions.

Apart from decisions on relatively routine matters, the report for 1916-1917 describes the nine Department Meetings for the year as follows.

> At these meetings departmental business was transacted, formal papers were presented by Professors Stouffer, Jordan, Lefschetz and Wheeler, and reports of attendance at scientific meetings made by Messrs. Van der Vries, Ashton, Mitchell and Stouffer. There was also an evening devoted to the discussion of the subject "The Content of a Course in College Algebra". . . .
>
> A pleasant custom inaugurated during the year was the regular monthly dinner of the department on the third Monday of the month at the University Club and the holding of the departmental meetings in the library of the club at the end of the dinner.

> A portable blackboard was ordered made and is now kept at the club for use in the presentation of papers.

The report for 1917-1918 contains formal minutes for Department Meetings held on October 16 and November 22, 1917, and January 15, March 5, and April 16, 1918. At the first meeting the Department organized its committees. At the November meeting Professor Mitchell gave a talk on "The Present Trend in High School Mathematics". The minutes of the January meeting read, in part:

> In response to a request from the Chancellor that the Department make a recommendation in regard to the Chairmanship of the Department, it was moved, seconded, and carried that:- "The Department recommend the appointment of Professor Ashton as Chairman for the remainder of the year." The above motion was approved by unanimous vote.

At the March meeting Professor Lefschetz gave a discussion of "Some Mathematical Problems of Aviation". The April meeting was summarized thus: "Professor Lefschetz gave an interesting report on his attendance at the recent meeting of the Chicago Section of the Mathematical Association [sic]. Professor Ashton gave a somewhat detailed discussion of the proposed budget submitted by him to the Dean of the College a few days ago."

These accounts describe the Department's methods and procedures, but they do not disclose the temper of the Department nor the nature of its recommendations to Dean Templin. The Department's attitude and the nature of its recommendations are indicated by the following statement in a letter Professor Van der Vries wrote to Dean Templin on May 27, 1914: "This department is the <u>poorest paid</u> department in the university (and this in spite of the fact that it is in the preparation of its individual members the <u>best prepared</u> department in the University)." The Department's complaints and recommendations had been developed in elaborate detail in an earlier letter from Professor Van der Vries to Dean Templin, dated March 18, 1914. (The complete letter appears in [S, ch. 3, sec. 1].) After outlining course and enrollment figures for 1913-1914, Van der Vries noted that the Department of Mathematics was surpassed in total enrollments only by history and English, and led all scientific departments in graduate enrollments. Van der Vries boasted that the mathematics staff "is equipped by preparation and experience in a manner not equalled by any of the other large departments of the University, 6 out of 9 members of the department possessing the degree of Doctor of Philosophy, 2 from Chicago University [sic], 2 from Clark University, 1 from Munich and 1 from Princeton". The chairman added, "And this in spite of the fact that [in mathematics] it takes more years of work to obtain the doctorate than in any other department". The library was "healthy", members of the mathematics club published solutions of problems frequently "in various mathematical journals", and faculty research was being energetically pursued. Nevertheless, Van der Vries wrote, the Department felt

> that its position in the university entitles it to a recognition which it does not now receive. It believes that it is entitled to two professorships from its present membership, even if an additional professor were brought in from the outside. . . . The department of Chemistry with 25 per cent less enrollment [than mathematics] has three professors and the departments of Botany, Bacteriology, Entomology and Zoology with a combined enrollment 16 per cent less than the department of mathematics have a total of 4 professors. . . . Moreover the department of mathematics has received during the past three academic years in its permanent personel [sic] a total increase in salaries of only $500.00. The average years of experience . . . of the members of the department of History was 11 years, of the department of English was 12 years and of the department of Mathematics was 14 years. The percentage of Ph. D.'s in the department of History at that time was 50 per cent, in the department of English 29.4 per cent and in the department of mathematics was 62.5 per cent. (Since that time the percentage in the department of mathematics has been

> increased to 66+.) And yet the average salary in the department of History was $1883, in the department of English $1423 and in the department of mathematics $1325.

Van der Vries then requested specific salary increases and forwarded the Department's recommendations for promotions (one of which was his own promotion to full professor). The chairman ended his letter to Dean Templin by saying: "The department is convinced that it is not asking for anything which in all reasonableness and fairness is not its due".

A letter which Professor Van der Vries' wrote to Dean Templin on October 25, 1916, further explains the Department's procedures, emphasizing that they were extremely democratic: all members of the staff participated in making recommendations for appointments, promotions, and salary increases. Furthermore, this letter is interesting because it contains the Department's evaluation of the staff, or at least of Professors Lefschetz, Mitchell, and Stouffer. Van der Vries wrote,

> On receipt of your letter of the 7th inst. I called together the department of mathematics and presented to it your request for a prospective budget for the biennium 1917-1919. After mature deliberation the department voted that each of its members send to the chairman a detailed statement of the views of the member on the departmental budget, emphasizing any discrepancies as to salary and rank which the writer believes to exist in the department, no writer to refer either to his own case or to that of the chairman. In this manner the case of each member of the department with the exception of the chairman has been considered by the nine other members of the department. The department emphasized that these letters to the chairman were to be considered as confidential by him and instructed him to take the arithmetical average of the various recommendations and to present to the Dean a budget as nearly as possible in conformance with the combined judgment of the department as manifested by these confidential letters.
>
> The vote of the department indicated that three members of

> the department are deserving of special consideration, viz., Professors Mitchell, Stouffer and Lefschetz. . . . I shall give here some of the reasons for the singling out of the above three men.
>
> Professor Mitchell's general mathematical equipment, his efficient service in charge of the education work of the department, his contributions to mathematical interests both in the state and abroad, his activity in general university interests and his exceptional ability as a teacher are all such as to warrant material consideration.
>
> Professor Stouffer's mathematical knowledge, his ability as a teacher and his good judgment in departmental affairs, his interest in the class room and along research lines are all so manifest as to warrant his promotion to an associate-professorship in 1917 and to immediate consideration financially of a pronounced character.
>
> Professor Lefschetz's ability as a mathematician and as a producer along original lines are such as to give him a first class reputation abroad and are moreover such as to leave no doubt as to justice of his monetary advancement. He is the most productive man of the department.
>
> My dear Dean Templin: I have attached three separate budgets, one a conservative one, one a budget in keeping with the first as to ratio and also in keeping with the increased cost of living, and third one a compromise between the first two. I shall leave to your more mature judgment the question of which of these three budgets should be submitted to the Chancellor with your approval.

The three budgets and Van der Vries' complete letter to Templin can be found in [S, ch. 3, sec. 2]. As a note to the compromise budget, Van der Vries stated, "It is a budget which should in all equity be the minimum to be adopted. The department's efficiency will be impaired if this is not adopted".

The committee system of departmental management is almost universally employed today, although there are variations in the way an entire department participates in making recommendations concerning appointments, promotions, and salaries. Dean Templin stated the case for the committee system in his report to Chancellor Strong in 1916 [Templin 5], and his arguments in favor of it (discussed above) are still valid.

The history related above shows that the Department of Mathematics followed democratic procedures in their most extreme form during the period from 1913 (and probably from 1911) to 1918. It is instructive to investigate the success of the committee system and the democratic procedures in this case, and to determine the extent to which they achieved the claims made by advocates of University democracy. The success of the system can best be measured in terms of development of the staff, budgets and salaries, and especially in terms of staff morale and *esprit de corps*. In these terms, the system was only partially successful in the period from 1911 to 1918. It seems likely, in fact, that Dean Templin was thinking of the Department of Mathematics when he wrote in 1920 [Templin 11, p. 190]:

> Much is said about the method of appointment to faculty positions, promotions in ranks, and the fixing of salaries. "Self determination," it is insisted, would secure and retain better men and women in the faculty, and would make them more contented and therefore more efficient. But such experiments as have been made with this method of making appointments to the faculty and the fixing of salaries have not borne out the theory.

As for the development of the staff, the period opened with the loss of John Wesley Young and Arthur Dunn Pitcher. Many received appointments to temporary instructorships, but H. E. Jordan, J. J. Wheeler, Solomon Lefschetz, and E. B. Stouffer were important additions to the permanent staff during this period (U. G. Mitchell had joined the Department in 1910). Almost nothing is known about the method of their appointment, because the five volumes of departmental reports make only a single reference to any of the circumstances or actions through which they were added to the staff. Professor Van der Vries, in a letter to Dean Templin dated March 27, 1916, forwarded the Department's recommendation

That Mr. John J. Wheeler, instructor, be promoted to an assistant professorship at $1300.00. Mr. Wheeler has been an instructor in the engineering school for the past five years. He was elected instructor partly on the recommendation of the late Dean F. O. Marvin who had visited Mr. Wheeler's classes while Mr. Wheeler was professor of mathematics at Friend's University at a time when Dean Marvin was a member of the Committee on Visitation of Kansas Colleges. Dean Marvin reported that the teaching of Mr. Wheeler was of a grade he had rarely seen equalled and was very much in favor of his engagement as instructor in the university. Mr. Wheeler has maintained the high standard expected of him and has done his work in a way that has met the unqualified approval of the men in the engineering school and is fully entitled to the recognition which his promotion would give him.

The Department regularly recommended promotions, and these were granted--but frequently after a delay of a year or two. Although Professor Van der Vries sometimes referred to the need for haste in recruiting instructors, almost nothing is known about the Department's or the University's appointment procedures. (Recall, however, that Chancellor Strong conducted the search for a Head Professor for the Department.)

The table below summarizes the budgets of the Department of Mathematics for the five year period covered by the reports. Several comments are in order concerning these budgets. First, Professor Van der Vries was on war leave during the spring semester of 1918; as a result, his salary for 1917-1918 was only $1250 rather than the $2500 shown. Mr. Larsen was employed for $600 during the spring semester in Professor Van der Vries' place. Second, Dean Stouffer taught astronomy courses (at that time in the Department of Physics) during 1915-1916 and 1916-1917; for each of these years he received a salary of $200 in addition to that shown in the table. The third comment concerns Professor Wheeler. The minutes of the Board of Administration for September 15, 1916, contain the following item: "On the recommendation of the Chancellor, J. J. Wheeler was appointed University Marshal to receive a total salary of $1400,

$900 from the department of mathematics and $500 from the appropriation for University Marshal." A description of the marshal's duties has not been found, but they certainly were more than leading the procession and presiding at Commencement.

Budgets of the Department of Mathematics, 1913-1918, in Dollars

| | 1913-14 | 1914-15 | 1915-16 | 1916-17 | 1917-18 |
|---|---|---|---|---|---|
| Professors | | | | | |
| Van der Vries | | 2200 | 2300 | 2400 | 2500 |
| Ashton | | | 2200 | 2300 | 2400 |
| Associate Professors | | | | | |
| Van der Vries | 2000 | | | | |
| Ashton | 1800 | 2000 | | | |
| Mitchell | | | 1700 | 1800 | 1900 |
| Stouffer | | | | | 1800 |
| Assistant Professors | | | | | |
| Mitchell | 1400 | 1600 | | | |
| Stouffer | | 1500 | 1500 | 1600 | |
| White | 1300 | | | | |
| Jordan | 1200 | 1300 | 1400 | 1500 | 1600 |
| Duval | 1200 | | | | |
| Wheeler | | | | 1300 | 1000 |
| Lefschetz | | | | 1300 | 1400 |
| Instructors | | | | | |
| Wheeler | 1000 | 1200 | 1200 | | |
| Lefschetz | 1200 | 1200 | 1200 | | |
| Conwell | 900 | 1000 | | | |
| Carus | | 1000 | | | |
| Holzinger | | | 800 | | |
| Larsen | | | 1000 | 1000 | (600) |
| Steimley | | | 900 | 1000 | |
| Miller | | | | 900 | 1000 |
| Rice | | | | | 400 |
| Library appropriation | 480 | 448 | 500 | 500 | 400 |
| Apparatus and supplies | 250 | 150 | 100 | 100 | 100 |
| Fellowships | 280 | 250 | 500 (2) | 280 | |

The University catalogs show that Professor Wheeler kept regular office hours in the Marshal's office in Robinson gymnasium. Professor Wheeler continued as University Marshal until about the time he retired from the University after World War II.

Finally, the regular budgets do not always include assistants who were hired as a result of unexpectedly large enrollments. The report for 1914-1915 states that Mr. B. F. Hazen, B.S., 1914, was paid $75 to teach a class of college algebra because of an unexpectedly large enrollment (sixty in two sections) of this subject. The report for 1916-1917 states that "part of the $400 saved from the salary of Professor Wheeler was used in engaging Mr. Otto J. Weir to take charge of a class in trigonometry the first semester and a class in solid geometry the second semester, and the remainder to engage Mrs. Hazel MacGregor Rice to take charge of a class in algebra the second semester". Mrs. Rice also taught two-thirds time during the first semester of 1917-1918, as shown in the table. (During the fall of 1918 Mrs. Alice Lefschetz was a temporary instructor [*The Graduate Magazine* 39]; she had been a graduate student at Clark University when her husband was there.)

Finally, what was the morale and *esprit de corps* in the Department during the period covered by the five reports? The record indicates that the situation could hardly have been worse. The departmental reports themselves disclose little, except for the complaining tone of the letters and recommendations Professor Van der Vries addressed to Dean Templin. But the oral tradition that has come down in the Department is emphatic in saying that the situation was bad. Dean Stouffer once told me that the University was finally forced to appoint the Department's chairman because the members of the staff were spending all of their time campaigning and electioneering, trying to get themselves elected. There was much bickering and quarreling in the Department; Professor Mitchell told Professor Wealthy Babcock (as she reported it to me in 1971) that he and Professor Ashton eventually decided to use their influence to establish peace in the Department again. Little is known about Professor Van der Vries; it would seem, however, that he did not have a very rich or warm personality. *The Graduate Magazine*--although still full of articles by and about Ephraim Miller--almost never referred to Van der Vries. Almost no photographs of Van der Vries have been found. Professor Van der Vries went on leave on February 1, 1918, for war-related work with the Chamber of Commerce of the United States; he kept the position permanently and never returned to academic work in Kansas or elsewhere. There is no record that he ever returned to Lawrence, even for a visit, after he left.

The committee system, although certainly not the cause of all of the Department's troubles, did not succeed in inspiring the staff to rise above its troubles and to achieve greatness in spite of very real difficulties. The Department failed in its efforts to obtain recognition and better salaries, and it almost destroyed itself in the process. Eventually, the Department gave up the fight for recognition and salaries. It agreed to establish an atmosphere of peace and cooperation, even if by doing so it accepted a lower position than it sought. The lack of financial support played an important part in the Department's defeat. In the last budget recommendations which appear in the reports, Professor Ashton wrote to Assistant Dean David L. Patterson (acting dean in Templin's absence):

> In the enclosed list we have asked for $3500 to obtain three instructors. It will certainly not be possible to obtain competent men for less than this and even with this amount it is probable

that it will be necessary to hire one or more women.

Along with the Department of Mathematics, the University itself suffered defeat. Chancellor Strong's emphasis on "State service" probably played a role in the University's defeat. The University provided "State service", Chancellor Strong presented the bill for it to the legislature, but the bill was not paid in full. Also, Chancellor Strong's promotion of "State service" shifted the emphasis away from scholarship and research, where it had been during the administration of Chancellor Snow. The Alumni Visitors' Report [*The Graduate Magazine* 20] warned that "'State service' is a siren song luring to disaster".

The period from 1910 to 1925 is important because it determined the character and status of the Department until after World War II. By 1920 most of the staff members who were to dominate the Department until 1945 or 1950 had been appointed. Also, the years between 1910 and 1920 fixed the Department's methods, procedures, program of courses and instruction, and location (both offices and library) on the campus for many years to come. The Department, however, did not continue the extreme forms of departmental democracy that it had practiced between 1913 and 1918; records are not available to trace the time and manner of the changes in this part of the Department's procedures. After J. W. Young left in 1911, Professors Stouffer and Lefschetz were the only members of the staff who published research papers. After Lefschetz left in 1924, Stouffer continued alone until about 1932, but for a period of about five years in the 1930's no one in the entire Department published any research. Finally, the period from 1910 to 1920 determined the status of the Department. Dean Stouffer told me, after I joined the Department in 1937, that the University had been forced to recognize that it could not maintain high quality departments in all fields; because financial support was difficult to obtain (and perhaps for other reasons), mathematics was not one of the departments chosen to be excellent. Even today the University finds the support of mathematics difficult; in 1967 or 1968, in separate conversations but not more than ten minutes apart, Francis H. Heller (then Dean of Faculties) and Chancellor Wescoe assured me that "it would be impossible to ask the State Legislature for anything in the name of mathematics".

An ancient proverb states, "When the gods arrive, the half-gods depart". Solomon Lefschetz arrived in the Department in September 1913, at the beginning of the events related in the five reports. During the period of struggle and turmoil, in both the Department and the University, which has been described, Professor Lefschetz quickly rose to international fame and profoundly influenced the development of modern mathematics. A history of the Department would be incomplete without an account of this remarkable man. Much biographical information about Professor Lefschetz is available [Lefschetz 1-5; S, Appendix V; S, Appendix IX, Lefschetz]; this account will attempt to supplement these sources with more detailed information about his years at The University of Kansas.

Solomon Lefschetz was born in Moscow, Russia, on September 3, 1884, but he was reared in Paris, France. He attended the École Centrale in Paris from 1902 to 1905, and graduated with the degree *ingénieur des arts et manufactures* in the autumn of 1905. Upon graduation he came to the United States and worked for a few months for the Baldwin Locomotive works. In 1907 he became an engineering apprentice and then a member of the engineering staff of the Westinghouse Electric and Manufacturing Company in Pittsburgh, Pennsylvania. His employment there terminated in 1910 as a result of an accident in which an electric transformer was shorted through his hands; he lost both hands from the resulting burns. Since his future as an engineer was not promising, and since he had always been interested in mathematics, he seized the opportunity to become a graduate student in mathematics at Clark University in 1910. There were two graduate students in mathematics at Clark in 1910-1911, himself and Alice Berg Hayes; there was also a good mathematics library. He wrote a Ph.D. thesis on a topic in algebraic geometry (to find information about the largest number of cusps that a plane curve of given degree may possess) under the supervision of Professor W. E. Story and received his Ph.D. degree in 1911.

Professor Lefschetz's first position was an assistantship at the University of Nebraska in Lincoln; he soon became a regular instructor. His teaching load was heavy, but he taught only freshman and sophomore classes. In his spare time he read Hilbert's recent papers on integral equations; he had already developed an enthusiastic interest in the subject by reading Fredholm's paper in the *Acta* while he was still a student at Clark University. In his fourth semester at Nebraska, Professor Lefschetz offered to lecture on Hilbert's recent work on integral equations; he has described the result as follows [Lefschetz 1,p.345; see also S, Appendix V]:

> Consequence: a very heavy teaching load for two students who I fear were quite bewildered. . . . The course taught me a valuable lesson: the experience generally absorbs too much energy. I have since expressed this opinion to many a recent doctor, but I fear that few heeded it.

An offer of a larger salary, attractive because of his approaching marriage, and a smaller teaching load (it was fifteen hours!) persuaded Professor Lefschetz to accept an instructorship at The University of Kansas in 1913. His coming to Kansas seems to have been an indirect result of the resignation of John Wesley Young in 1911, for the report for 1913-1914 says: "There has however been in the budget for the department up to the present year an allowance of $2500 for a Professorship. Of this 1200 has been used during the present year as the salary of Dr. Lefschetz. . . ." Dr. Lefschetz married Alice Berg Hayes on July 3, 1913, and began teaching at Lawrence in September. They established a residence in a small cottage at 937 Missouri Street; it was their home throughout their years in Lawrence.

The report for 1913-1914, states that "the members of the Department are working on problems in their respective fields, . . . Doctor Lefschetz in Geometry. . . ." The precise meaning of this statement is not clear, because the same report also says, in reporting on departmental meetings: "In addition to transacting the regular business of the department the time was spent in the discussion of the subject 'Integral Equations' with papers on the same by Professor Ashton, Miss White and Doctor Lefschetz."

There are some today who say that Professor Lefschetz did his best research work during his years at The University of Kansas; nevertheless, he taught no advanced courses in the Department, probably because he remembered his unsatisfactory experience with integral equations at the University of Nebraska. Professor Paul A. Smith, who received a master's degree under Professor Lefschetz at Kansas in 1923 and a Ph.D. under him at Princeton in 1925, has commented on this failure to teach advanced courses. Speaking at the Department's Honors Dinner in 1970, Professor Smith pointed out that typically, in the 1910-1925 era, professors did not lecture on their research,whereas, in 1970, they did. Furthermore, Professor Lefschetz never taught in the Summer Session; since other instructors--even at the graduate student level--did teach in the summer, Professor Lefschetz's failure to do so indicates that he chose to spend his time on research.

As Professor Lefschetz has pointed out [Lefschetz 1, p. 346], he was assigned to the engineering part of the Department. There were separate sections of the beginning courses in analytic geometry and calculus for engineers, and Professor Lefschetz was usually assigned to teach them. During the first semester of 1913-1914, he taught college algebra, trigonometry, analytic geometry, and calculus (fifteen hours); in the second semester, he taught college algebra, trigonometry, and analytic geometry (twelve hours). In the first semester of 1914-1915, he taught college algebra, trigonometry, and calculus (fifteen hours); in the second semester, analytic geometry and calculus (thirteen hours). In the first semester of 1915-1916 he taught college algebra, trigonometry, calculus, and the theory of numbers (fifteen hours); in the second he taught analytic geometry and calculus (thirteen hours) and directed two thesis students. In the first semester of 1916-1917 he taught algebra and trigonometry, analytic geometry, and differential equations (thirteen hours); in the second semester, analytic geometry, calculus, and number theory (fifteen hours). In the first semester of 1917-1918 he taught college algebra, trigonometry, and calculus (ten hours), had one student in a reading course, and taught a war-related course on aviation; in the second semester, analytic geometry, calculus, and analytic mechanics (thirteen hours). Professor Lefschetz frequently taught two sections of the same course. The enrollment in his largest class in the period 1913-1918 was thirty-one students; a class with more than twenty-five students was rare, and many classes were much smaller.

During World War II, Professor Lefschetz undertook research on differential equations; his World War I contribution was made through the study and teaching of aviation. In a statement written in the fall of 1917, the report for 1917-1918 says: "During the summer a demand for courses in aviation seemed assured and arrangements were made whereby Professor Lefschetz could be relieved of five hours of Freshman teaching to take up this work. He is now giving a two hour course in this subject with a class of seventeen students." Furthermore, Professor Lefschetz gave the talk at the opening meeting of the mathematics club on October 8, 1917; the title of his talk was "Air Planes". And at a Department meeting held on March 5, 1918, Professor Lefschetz gave a talk entitled "Some Mathematical Problems of Aviation".

Professor Lefschetz participated in all of the mathematical activities of the Department. The report for 1914-1915 shows that Mr. H. H. Conwell received a master's degree in 1915; his thesis, entitled "A Special Riemann Surface with Application to the Hyper-Elliptic Case", had been supervised by Professor Lefschetz. Mr. Conwell was appointed an assistant professor at the University of Idaho for 1914-1915; later he was a professor and a dean at Beloit College in Wisconsin. Miss Eva L. Trimble received a master's degree in 1916 with a thesis entitled "Set of Problems of the Circle Arranged by Type Form", also supervised by Professor Lefschetz. Miss Trimble obtained a position in the high school in Meade, Kansas for 1916-1917.

This list of Professor Lefschetz's master's students is probably not complete, but there was at least one other--and a highly important one. Apparently members of the staff had maintained friendly relations with Professor J. W. Young at Dartmouth College. After Professor Lefschetz had won the Bordin Prize of the French Academy and had become internationally famous, the Department learned that Dartmouth had a student, Paul Althaus Smith, of exceptional promise. Mr. Smith was persuaded to come to The University of Kansas to study with Professor Lefschetz; he was a graduate student and an instructor in the Department from 1921 to 1923. He received a master's degree in 1923, Professor Lefschetz having supervised his thesis entitled "On Jordan

Curves"; in 1925 Smith received his Ph.D. degree under Professor Lefschetz at Princeton. Professor Smith, elected to membership in the National Academy of Sciences, is the Department's most distinguished graduate; it is curious that Professor Lefschetz does not mention him in his "Reminiscences" in connection with either Kansas or Princeton [Lefschetz 1; S, Appendix V].

The following excerpt from Professor Lefschetz's "Reminiscences" [Lefschetz 1, p. 346] explains much about his attitude toward the Department and The University of Kansas.

> The rule in Lawrence for beginning faculty members was three years in each position and it was rather rigidly enforced. The situation did not seem perfect--far from it. However, I discovered in myself, first a total lack of desire to "reform" coupled with a large adaptive capacity. At Lawrence I only cooperated with a colleague in driving out several unattractive texts, notably Granville's Calculus, for which my taste was $< \epsilon$.

The Department's reports verify Professor Lefschetz's comment about Granville's *Calculus*. The report for 1913-1914 shows that Granville's *Differential and Integral Calculus, Revised*, was used in College classes. The report of the Textbook Committee for 1914-1915 states that the Committee decided to use Granville's *Revised Calculus* in both College and Engineering classes during the second semester. In the fall of 1916, Granville's *Calculus* was replaced by Townsend and Goodenough's *Essentials of Calculus* in Engineering classes; beginning in the fall semester of 1917, Love's *Differential and Integral Calculus* was used in all University classes. Other textbooks were changed, but there is no way to tell which ones Professor Lefschetz objected to; neither do the reports identify the colleague who collaborated with him in banishing the offending books.

Professor Lefschetz's "total lack of desire to 'reform' coupled with a large adaptive capacity" should not be misunderstood: he participated fully in the mathematical activities of the Department and of the state. First of all, as required under the committee system, Professor Lefschetz served on a committee; throughout the five years covered by the reports, he was a member of the Committee on Library and Apparatus. The principal duty of this committee was to order books and journals for the Mathematics Library. In his "Reminiscences", Lefschetz reported that in "both Nebraska and Kansas I found good and well-kept mathematical libraries, ample at least for my own purposes" [Lefschetz 1, p. 346].

Also, Professor Lefschetz gave many talks and special lectures (some of which have been described already), participated in state activities, and published research papers. For example, on October 11, 1915, Professor Lefschetz gave a talk entitled "Fermat's Theorem and Allied Topics" to the mathematics club. On December 2, 1916, Professor Lefschetz presented a paper entitled "On the Residues of Double Integrals Belonging to an Algebraic Surface" at a meeting of the Southwestern Section of the American Mathematical Society in Lawrence. Also, he presented by title a paper, "On Certain Two-Dimensional Cycles Belonging to an Algebraic Surface", at the spring 1917 meeting of the Chicago Section of the American Mathematical Society. The departmental report for 1916-1917 lists four research papers published by Lefschetz in Italy, France, and England and in the *Kansas University Science Bulletin* [Archibald 1, nos. 12, 13, 14, and 16 in the bibliography on pp. 238-239; papers 7, 8, and 11 in this bibliography had been listed in the report for 1915-1916]. At a Department meeting on April 16, 1918, Professor Lefschetz gave a report on the spring meeting of the Chicago Section of the AMS, which he had attended. Finally, Professor Lefschetz gave a paper entitled "Intersections of Circles and Conics" at a meeting of the Kansas Section of the Mathematical Association of America held in Topeka on November 9, 1917.

Professor Lefschetz helped to establish the Kansas Section of the MAA; it was the first section established in the new organization formed in December 1915 [Archibald 1, p. 79]. The report for 1914-1915 contains the following paragraph.

> The Department took the initiative in setting on foot a movement towards the forming of a state society for the promotion of the teaching of mathematics of collegiate grade. A preliminary meeting was held at the time of the Twelfth Annual Conference of Kansas High Schools and Academies. Professor Slaught of The University of Chicago was also present. A committee of three was appointed to take the necessary steps for the holding of a meeting at the time of the State Teachers' Meeting at Topeka in November, 1915, and for the stirring up of interest in the new society. Dr. Lefschetz was the University representative on this committee.

Along with Professor Lefschetz, the committee consisted of A. J. Hoare of Fairmount College in Wichita and T. F. Mergendahl of the College of Emporia. As part of the effort to form an association of Kansas mathematicians, the committee sent a letter to all teachers of mathematics in the state. The letter began by recounting a discussion held for college and university mathematics teachers as part of the Mathematics Round Table at the Twelfth Annual Conference of Kansas High Schools and Academies in Lawrence on March 26-27, 1915.

> The session was a very successful one. It was fortunate in having present Professor H. E. Slaught of The University of Chicago. Professor Slaught pointed out the difficulty under which college teachers were laboring, there being for them no opportunity for getting together at regular intervals, in an association or otherwise, for the discussion of those questions of particular interest to them. The only journal at their disposal is The Mathematical Monthly which has for this very reason the financial as well as the moral support of 14 institutions of collegiate or university rank.

The larger part of the discussion had to do with the advisability of having a Kansas College Mathematics Teachers' Association. It was hoped that this association and similar associations in other states would constitute what may eventually be known as The National Association of College and University Mathematics Teachers. This association will thus fill the gap between The American Mathematical Society which is mainly for research work and The Kansas State Teachers' Association which deals in one of its sections mainly with the teaching of secondary mathematics. The annual dues for membership in The National Association would probably be $3.00 which will include the subscription for its official publication, The American Mathematical Monthly.

There was appointed last December a committee of The Council of The American Mathematical Society to consider whether the society wished to enter actively into the field now being fostered by the American Mathematical Monthly. This committee consisted of three members from the eastern part of the country together with Professor Slaught and Professor Hedrick of The University of Missouri. After long and careful deliberation the committee decided by a vote of 3 to 2 and the Council by an overwhelming vote at the New York meeting of April 24th that the society would not enter this field. But the Council passed a resolution expressing its interest in this work and pledging strong and hearty cooperation and good will in case another society should be organized to operate in this field and to have The Monthly as its official organ.

It was thought by all present at the meeting in Lawrence that the mathematics teachers of the Kansas colleges and state institutions should organize and have a least one meeting annually in which the teaching and subject matter of college mathematics should be the main theme. Few college teachers attend the annual meetings in Topeka in November and participate in the discussions held. We are sure however that we are not mistaken in assuming that you would gladly attend meetings where topics were discussed which will redound to better teaching of collegiate mathematics.

The outcome of the two hours discussion was the appointment of the undersigned [Hoare, Lefschetz, and Mergendahl] as a committee to take up this question of organization and to present it to the college mathematics teachers of the state. This committee therefore desires to know your opinion on the matter in question. It would be pleased to receive a frank letter from you regarding your views on this entire matter. The committee has not decided upon any definite line of action. It is planning however to organize a meeting of college instructors to be held at the time of the fall meeting of the Kansas State Teachers Association.

We sincerely hope that this movement will impress you as a correct one and that you will give it your loyal support. Any suggestions or criticisms will be gladly received. . . .

As hoped, a state organization was formed at Topeka in November 1915. This organization became the first Section of the Association, being the first to submit its application for Section status after the formation of the MAA in December 1915. The Kansas group held its first meeting as a Section of the MAA in Lawrence on March 18, 1916. The *Monthly* published a report of the meeting and a group photograph of those who attended; Ashton, Jordan, Lefschetz, Mitchell, Van der Vries, and Wheeler are conspicuous in this photograph [*American Mathematical Monthly* 1].

The Department recognized Lefschetz's genius early, and it did all it could within the system to gain recognition for him through promotions and salary increases. His position was unchanged for three years, but he was promoted to an assistant professorship in 1916, to an associate professorship in January 1920, and to a full professorship in 1923. In each of the years 1916-1917 and 1917-1918 he received a raise of $100 in salary (the record is available only through 1917-1918), and a larger raise was recommended for 1918-1919. He was repeatedly singled out as deserving of special consideration, as indicated in the letter (quoted above) which Professor Van der Vries sent to Dean Templin on October 25, 1916.

> Professor Lefschetz's ability as a mathematician and as a producer along original lines are such as to give him a first class reputation abroad and are moreover such as to leave no doubt as to justice of his monetary advancement. He is the most productive man of the department.

In spite of the Department's best efforts, however, Professor Lefschetz's salary increases were small. Under many restrictions and after many failures, the Department recommended a minimum salary of $1500 and a maximum salary of

$1900 for him for 1918-1919.

In spite of what might appear as a lack of appreciation in his own University, Lefschetz's success and rise to fame were rapid. He received the Bordin Prize of the French Academy in 1919; *The Graduate Magazine* announced his award as follows [*The Graduate Magazine* 41]:

> Solomon Lefschetz, assistant professor in mathematics, has been awarded the Bordin prize of three thousand francs by the French Academy of Science. It is the first time the prize has been awarded to an American. The prize is offered by the Academy for an original memoir on an assigned subject in mathematics or physics and is open to the world. Mr. Lefschetz's paper was on a special topic in geometry and was announced in 1917, two years being allowed for the completion of the work.

Professor Lefschetz also received the Bocher Prize of the American Mathematical Society in 1924, the Order of the Aztec Eagle from the Mexican Government in 1964, and the U.S. National Medal of Science (which Professor Lefschetz sometimes forgot to mention) from President Johnson in 1965. The Department of Mathematics of The University of Kansas--and of Princeton University also, I am sure--nominated Professor Lefschetz for the National Medal of Science. He was a visiting professor at Princeton University in 1924-1925; his position there was made permanent in 1925, and he never returned to his position at The University of Kansas.

Professor Lefschetz has contributed to three major fields of mathematics: algebraic geometry, topology, and differential equations and stability theory. The following list of books which he has written or edited will serve to indicate the extent of his contributions to mathematics.

1. *L'Analysis Situs et la Géométrie Algébrique* (É. Borel Monographs), Paris, 1924, vi + 154 pages.

2. *Topology* (American Mathematical Society Colloquium Publications, volume 12), 1930, ix + 410 pages.

3. *Algebraic Topology* (American Mathematical Society Colloquium Publications, volume 27), 1942, vi + 389 pages.

4. *Introduction to Topology*. Princeton, N.J.: Princeton University Press, 1949. viii + 218 pages.

5. *Algebraic Geometry*. Princeton, N.J.: Princeton University Press, 1953. 233 pages.

6. *Differential Equations: Geometric Theory*. 2nd ed., New York: Wiley (Interscience), 1963.

7. (With J. P. LaSalle) *Stability By Liapunov's Direct Method with Applications*. New York: Academic Press, 1961.

8. *Stability of Nonlinear Control Systems*. New York: Academic Press, 1965.

9. (Edited with Joseph P. LaSalle). *International Symposium on Nonlinear Differential Equations and Nonlinear Mechanics*. New York: Academic Press, 1963.


What manner of man was Professor Lefschetz? I saw him for the first time at the meetings of the American Mathematical Society and the Mathematical Association of America held during the week of September 8-12, 1930, at Brown University in Providence, Rhode Island. He was a man of medium height, well formed, and in the full vigor of middle life. His hair was thick and black, cut rather short almost in crew-cut style; he wore a short black moustache. He had intense, piercing black eyes.

I met Professor Lefschetz for the first time when he visited Brown University in the spring of 1937. I was assigned to be his guide and chauffeur. I found him--as others have--to be blunt, outspoken, and contrary, but without malice. I had already decided to join the K. U. Department of Mathematics in

September 1937. Knowing this, he looked at me and asked, "Are you married?" When I replied, "No", he said, "You had better get married; Lawrence is no place for a single man".

Professor Wealthy Babcock relates the following story. Professor Lefschetz was asked one day, "Do you have a horse?"

"No", he retorted, "I don't have any hay; how could I own a horse?"

Professor D. C. Spencer, a member of the Department of Mathematics of Princeton University, visited The University of Kansas on April 8, 1971. He told me that a few days before, Professor Lefschetz, then nearly eighty-seven, had walked down to the new Fine Hall at Princeton in a wet snowstorm twice on a single day. After one of these visits Spencer was trying to help Lefschetz into his car to give him a ride home and was trying also to hold his umbrella over him to keep the wet snow off. But Professor Lefschetz was annoyed; he snapped at Spencer: "What's the matter? Are you afraid of a little water?--Why, I take a shower every day!"

Professor Spencer also related the following anecdote. Many years ago Einstein complained to Professor Lefschetz that he was annoyed by all of the publicity he received--by all the attention from reporters and photographers.

"It's your own fault", said Professor Lefschetz. "If you would get a hair-cut, nobody would bother you!"

Professor Lefschetz had a long and productive career at Princeton which he has described in his "Reminiscences". He was Chairman of the Department of Mathematics there from 1945 to 1953, when he became Professor Emeritus. In the fall of 1953 Professor and Mrs. Lefschetz visited Lawrence at the invitation of the Department of Mathematics. They stayed in the chancellor's guest house, and a reception was given for them at the Faculty Club. Professor Lefschetz gave a lecture, but his stay in Lawrence was mainly an occasion for visiting with his former friends. Professors Babcock, Black, Smith, and Stouffer were still active in the Department, and Professors Jordan and Wheeler were still in Lawrence although they had retired from the University. A group photograph was taken and later published in the *University of Kansas Alumni Magazine* [*The Graduate Magazine* 42]; this photograph includes Professor and Mrs. Lefschetz and Professors Wealthy Babcock, Florence Black, G. B. Price, G. W. Smith, and E. B. Stouffer. This visit enabled Professor Lefschetz to enjoy once again the setting in which he had first done important mathematical research. He has written in his "Reminiscences" that The University was on top of quite a hill, with well-constructed and mostly recent buildings. . . . The view from the top was exceptionally attractive . . . my friends and I indulged in many country walks."

But retirement from Princeton did not bring the study of mathematics to an end for Professor Lefschetz. His "Reminiscences" recount his activities at the National University of Mexico and at the Research Institute for Advanced Study in Baltimore. Professor Lefschetz had learned Spanish after 1944; his fluent command of Russian, French, English, and Spanish entitle him to recognition as an accomplished linguist. Professor Lefschetz was one of the speakers at the dedication of the new Fine Hall at Princeton University in the spring of 1970. Professor Lefschetz died on October 27, 1972.

## Staff of the Department of Mathematics

### 1918-1919

Professor Van der Vries (Absent on leave)
Professor Ashton, Chairman
Associate Professor Mitchell
Associate Professor Stouffer
Assistant Professor Jordan

Assistant Professor Wheeler
Assistant Professor Lefschetz
Anna Marm, Instructor in Mathematics
A.B., Bethany College, 1909; A.M., Kansas, 1918. Present position, 1918.
Florence Black, Instructor in Mathematics
A.B., Kansas, 1913. Present position, 1918.
Cyril Arthur Nelson, Instructor in Mathematics
A.B., Midland, 1914; A.M., Kansas, 1916; Ph.D., Chicago, 1919. Present position, third quarter, 1918-1919.

The report of the Department of Mathematics for 1917-1918 contains a letter dated April 12, 1918, from Professor Ashton to Dean Patterson, in which Ashton made his budget requests for 1918-1919. In this letter Professor Ashton wrote: "In the enclosed list we have asked for $3500 to obtain three instructors. It will certainly not be possible to obtain competent men for less than this and even with this amount it is probable that it will be necessary to hire one or more women." It is not known what funds for instructors the Department received in reply to this request, but the record does show that the Department appointed two women for the year 1918-1919.

The same report contains also a letter dated April 19, 1918, from Dean F. W. Blackmar to Ashton, which reports on the appointment of fellows for 1918-1919. The letter states that Beulah M. Armstrong and Anna Marm were awarded university fellowships, but that Miss Armstrong had resigned. The record for the following year shows that Anna Marm resigned to accept an instructorship. Dean Blackmar reported that a University Fellowship for Kansas colleges had been awarded to Lawrence Murray Graves, A.B., '18, Washburn. The catalog for 1918-1919 states that Graves also resigned. L. M. Graves later received M.A. and Ph.D. degrees from the University of Chicago and spent his life as a prominent member of the faculty of that university.

## 1919-1920

Professor Ashton, Chairman
Associate Professor Mitchell
Associate Professor Stouffer
Associate Professor Lefschetz (Promotion in January, 1920)
Assistant Professor Jordan
Assistant Professor Wheeler
Instructor Marm
Instructor Black
Instructor Nelson
Hazel MacGregor Rice, Instructor in Mathematics
A.B., Yankton College, 1906; A.M., University of Illinois, 1909. Instructor in Mathematics, Kansas, 1911-13; 1917-18. Present position, 1919.
Cornelius Gouwens, Instructor in Mathematics
B.S., Northwestern, 1910; A.M., Illinois, 1911. Instructor, Bennett Academy, 1911-1912; Instructor, Iowa U., 1912-16. Present position, 1919.

(For biographies of Nelson and Gouwens from *American Men of Science*, Sixth Edition, 1938, see Appendix IX of the Supplemental Volume.)

## 1920-1921

Professor Ashton, Chairman
Professor Mitchell
Associate Professor Stouffer
Associate Professor Lefschetz
Assistant Professor Jordan
Assistant Professor Wheeler
Guy Watson Smith, Assistant Professor of Mathematics
B.S. (E. E.), Colorado, 1908; M.S., Colorado, 1909; Ph.D., Illinois, 1917. Instructor in Mathematics, Colorado, 1909-13; Instructor in Mathematics and Physics, Beloit College, 1917-18; Instructor in Mathematics, Kentucky, 1918-20. Present position, 1920.
Instructor Marm
Instructor Black
Instructor Rice
Thomas Bravais Henry, Instructor in Mathematics
A.B., Kansas, 1898. Present position, 1920.
Wealthy Babcock, Instructor in Mathematics
A.B., Kansas, 1919. Present position, 1920.

Raymond Hamilton Carpenter, Instructor in Mathematics
A.B., Washburn, 1916; A.M., Kansas, 1917. Present position, 1920.
Nina Mildred McLatchey, Instructor in Mathematics
A.B., Washburn, 1911. Present position, 1920.
Nellie Mary Young, Instructor in Mathematics
A.B., Kansas, 1920. Present position, 1920.

(Professor Smith's biography from *American Men of Science*, Ninth Edition, 1955, appears in Appendix IX.)

The increase in the size of the staff in 1919-1920 and 1920-1921 emphasizes the increase in the University's enrollment following World War I. For 1920-1921 the total enrollment during the regular session was reported to be 3680. Chancellor E. H. Lindley assumed office in the fall of 1920; Olin Templin resigned as Dean that year and Professor J. G. Brandt was appointed Acting Dean (the appointment soon was made permanent) of the College of Liberal Arts and Sciences. The University Library reported that it had 140,110 volumes and 45,000 pamphlets; it received an annual appropriation of $18,000.

## 1921-1922

Professor Ashton, Chairman
Professor Emeritus Ephraim Miller
Professor Mitchell
Professor Stouffer (Promotion)
Professor Lefschetz (He claims his promotion came in 1923)
Assistant Professor Jordan
Assistant Professor Wheeler
Assistant Professor G. W. Smith
Instructor Florence Black
Instructor Thomas Bravais Henry
Instructor Wealthy Babcock
Instructor R. H. Carpenter
Instructor N. M. McLatchey
Helen M. Walker, A.M., Instructor in the Teaching of Mathematics
Otto B. Loewen, A.B., Assistant Instructor in Mathematics
Paul A. Smith, B.S., Instructor in Mathematics

Edith Steininger, A.B., Assistant Instructor in Mathematics
Walter Z. Bagley, M.S., Assistant Instructor in Mathematics

## 1922-1923

Professor Ashton, Chairman
Professor Emeritus Ephraim Miller
Professor Mitchell
Professor Stouffer
Associate Professor Lefschetz (Lefschetz is listed as a Professor by the Department of Mathematics, but he is an Associate Professor in the faculty list in the University catalog.)
Assistant Professor Jordan
Assistant Professor Wheeler
Assistant Professor G. W. Smith
Florence Black, A.M., Instructor in Mathematics
Thomas Bravais Henry, A.M., Instructor in Mathematics
Wealthy Babcock, A.M., Instructor in Mathematics
R. H. Carpenter, A.M., Instructor in Mathematics
N. M. McLatchey, A.M., Instructor in Mathematics
Helen M. Walker, A.M., Instructor in the Teaching of Mathematics
Otto B. Loewen, A.B., Assistant Instructor in Mathematics
Paul A. Smith, B.S., Instructor in Mathematics
Edith Steininger, A.B., Assistant Instructor in Mathematics
Walter Z. Bagley, M.S., Assistant Instructor in Mathematics

T. B. Henry, N. M. McLatchey, and Otto B. Loewen resigned in June 1922, and Helen M. Walker, Edith Steininger, and Walter Z. Bagley were appointed in June 1922.

The 1922-1923 catalog lists the following course on algebraic functions. It is the only course I have found in the catalog that seems in any way related to Professor Lefschetz's special field of research, but I have not found any evidence that he ever taught it.

Mathematics 120. Algebraic Functions. Three hours credit throughout the year. Algebraic functions and their integrals. Riemann surfaces. Application to the geometry on curves of genus one. Prerequisite, course 57 (complex numbers). (Not offered in 1922-1923.) Lefschetz

The total enrollment during the regular session for 1922-1923 was 3993, and there were 154 students in the Graduate School. The total enrollment in the 1922 Summer Session was 1656. The University Library that year claimed 150,104 volumes and received an annual appropriation of $18,000.

It might be assumed that Professor Guy W. Smith was a replacement for Professor Van der Vries, but there have been no further major appointments. The additional staff needed to teach the increasing number of students was obtained by appointing instructors and assistant instructors, nearly all of whom were temporary.

## 1923-1924

Chairman: C. H. Ashton. Room 206, East Administration Building
Professors: Ashton, Mitchell, Stouffer, Lefschetz
Assistant Professors: Jordan, Wheeler, G. W. Smith
Instructors: Black, Babcock, Walker, Smith (Paul A.)
Assistant Instructors: Edith Steininger, A.B.; Lucretia Mae Switser, A.M.; Helen Rose Garman, A.B.; Charles Arthur Messick, B.S.

Although the catalog lists Paul A. Smith as a member of the staff during 1923-1924, he stated in his *American Men of Science* biography, Eleventh Edition (1967), that he was at the University of Chicago that year [S, Appendix IX, Smith]. In her biography in the Sixth Edition (1938) of *American Men of Science* [S, Appendix IX, Walker], it is noteworthy that the ranks Helen M. Walker gave herself at The University of Kansas are consistently higher than those listed in the University catalogs. Professor Messick's *American Men of Science* biography (also, Sixth Edition) appears in Appendix IX of the Supplemental Volume.

1924-1925

Chairman: C. H. Ashton. Room 206, East Administration Building.
Professors: Ashton, Mitchell, Stouffer, Lefschetz
Assistant Professors: Jordan, Wheeler, G. W. Smith, Walker
Instructors: Florence Black, A.M.; Wealthy Babcock, A.M.; R. H. Marquis, A.B.; Lucretia Mae Switser, A.M.
Assistant Instructors: Charles Arthur Messick, B.S.; R. G. Smith, A.B.; P. F. Wall, A.B.; Charles Arthur Reagan, B.S.

Professor Lefschetz was on leave during 1924-1925 as a visiting professor at Princeton University; he did not return to his position at The University of Kansas.

The University continued to grow, and the staff seemed inadequate to handle the load of instruction. The total enrollment during the regular session 1924-1925 was 4210; the enrollment for the 1924 Summer Session was 1524; and the total enrollment in the Graduate School during 1924-1925 was 263. The University Library now had 167,210 volumes. One indication that the recent instructors and assistant instructors were not very strong mathematically is the fact that relatively few of them were ever listed in *American Men of Science*; several exceptions are Professors Robert Houghton Marquis, Charles Arthur Reagan (both, Sixth Edition, 1938) and Ronald Gibson Smith (Eleventh Edition, 1967) [S, Appendix IX].

The period from 1910 to 1925 had opened with great promise. The preceding period had been dominated by Ephraim Miller, a great teacher, and Henry Byron

Newson, who had rounded out an excellent department by adding research to Miller's teaching. Then came John Wesley Young--energetic, young, and nationally prominent--, who showed great promise of leading the Department forward from the point it had reached under Miller and Newson. However, the department suffered a great blow in 1911 when, after a single year, Young resigned and took A. D. Pitcher with him to Dartmouth. Chancellor Strong's efforts to obtain another Head Professor failed, but the Department rallied, established the committee system of departmental management, and went forward under Professor Van der Vries as Chairman. In 1913 Dr. Solomon Lefschetz was appointed to an instructorship, and he rapidly developed into the most distinguished mathematician the Department has ever had on its staff. His eventual loss to the Department was foretold by the award to him of the Bordin Prize in 1919. Dean E. B. Stouffer was appointed to an assistant professorship in 1914; the early recognition of his sound judgment foretold his appointment to high administrative positions. The Department as well as the University suffered from harsh and unsympathetic management by the Board of Administration and especially from inadequate financial support. World War I disrupted the University's program and greatly increased the unrest in the faculty. Moreover, the inflation that accompanied and followed the war added to the seriousness and severity of the University's low salary scale. Many leading members of the faculty resigned and took positions elsewhere. In particular, Professor Van der Vries did not return from the war assignment which he accepted in Chicago in 1918. Chancellor Strong, exhausted by the war and by his struggles with the faculty, the Board of Administration, and the State Legislature, resigned and was succeeded by Ernest Hiram Lindley in 1920. The political situation in the state had deteriorated still further, however, and the University was politically vulnerable through the Board of Administration, of which the Governor was Chairman. Nothing was done to improve the salary scale after Lindley became chancellor in 1920; the political axe fell in 1924 when Governor Davis removed Lindley from his position as chancellor. In the same year, Professor Lefschetz went to Princeton as a visiting professor; no one was surprised that he did not return to Lawrence. Dean Stouffer was left as the only mathematician on the staff who engaged in research, but he was largely lost to the Department because he was appointed Dean of the Graduate School in 1922. He served also as the Chairman of the University's Central Budget Committee for many years. In 1925 the Department could point to a distinguished past, but there was little basis for hope for the future. Many years would pass before the Department of Mathematics again would become an active center of mathematical research.

# Chapter 4

## Depression, Drought, and World War II

### 1925-1945

Although the University achieved many successes between 1910 and 1925, this period remains the most troubled one in its first century. Frank Strong, a great leader, was chancellor until 1920; Olin Templin, a tireless worker in support of the University, was Dean of the College from 1903 to 1920; and Solomon Lefschetz, an internationally famous mathematician, was a member of the staff of the Department of Mathematics. Strong Hall, the finest of the University's buildings, was built at this time: construction of the east wing was started in December 1909, and the center section was finally completed in January 1924 [Taft 1, pp. 100-101]. But this period also brought harsh management by the Board of Administration, financial starvation by the legislature, resignations of many of the University's most distinguished faculty members because of low salaries, a faculty revolt, World War I, and finally the removal of Chancellor Lindley from his position by the out-going Governor, Jonathan M. Davis, in December 1924. The year 1925 brought hope that a new era had dawned: Governor Paulen reinstated Lindley as chancellor on January 13, 1925, and the legislature abolished the political Board of Administration and created a new Board of Regents--one that all hoped would be non-political.

The University's building program made an auspicious fresh start at the beginning of Chancellor Lindley's administration in 1920, and, although it achieved only partial success in the end, the building program was nevertheless one of the more successful parts of the University's program in the period from 1925 to 1945. The record shows that the following buildings were completed on the campus in the years indicated.

| | |
|---|---|
| Six sections of Stadium (the gift of alumni, students, and friends as a war memorial) | 1921 |
| Electrical Engineering Laboratory | 1921 |
| Power Plant | 1922 |
| Corbin Hall (womens' residence hall) | 1923 |
| Center Section of Strong Hall | 1924 |
| Watson Library | 1924 |
| Two additional sections of Stadium (gifts as before) | 1925 |
| Watkins Hall (residence hall for self-supporting women; the gift of Mrs. J. B. Watkins) | 1926 |
| Memorial Union Building (the gift of alumni, students, and friends as a war memorial) | 1927 |
| North end of Stadium (gift as before) | 1927 |
| Hoch Auditorium | 1927 |
| Snow Hall (replacement of old Snow Hall) | 1929 |
| Home Economics Practice House | 1930 |
| Watkins Memorial Hospital (students health service; the gift of Mrs. J. B. Watkins) | 1931 |
| Miller Hall (residence hall for self-supporting women; the gift of Mrs. J. B. Watkins) | 1937 |
| Watkins Nurses' Home (student hospital staff residence; a gift of Mrs. J. B. Watkins) | 1937 |
| Chancellor's Residence (the gift of Mrs. J. B. Watkins) | 1939 |
| Battenfeld Hall (residence hall for self-supporting men; the gift of Mr. and Mrs. J. R. Battenfeld of Kansas City) | 1940 |

| | |
|---|---|
| Templin Hall (residence hall for self-supporting men; gift of alumni and friends on the occasion of the 75th anniversary of the University) | 1940 |
| Jolliffe Hall (residence hall for self-supporting men) | 1942 |
| Foster Hall (residence hall for men; the gift of Mr. O. Jolliffe) | 1943 |
| Lindley Hall | 1943 |
| Military Science Building | 1943 |
| Engineering Experiment Building | 1943 |

This list of buildings emphasizes two facts: first, the small number of buildings provided by the legislature; second, the important role played by the Endowment Association in the growth of the University. During the period from 1925 to 1945 the legislature appropriated funds to build Watson Library, Hoch Auditorium, Snow Hall (a replacement for the old Snow Hall, which had deteriorated structurally), and Lindley Hall [*The Graduate Magazine* 43-45, 73, 81; see also Taft 1, 2], but the state provided funds for no other significant academic building in this period. No major academic building was built on the campus between 1929 and 1943.

The Endowment Association became a major source of support for the University in the period 1920-1945. Early in 1920 the Endowment Association developed plans for its "Million Dollar Drive" to raise funds to build the Stadium and the Memorial Union [*The Graduate Magazine* 32]. This drive was accompanied by a reorganization of the Endowment Association in which Chancellor Lindley became its president and Olin Templin (who had just resigned as Dean of the College) became its secretary [Templin 10]. In 1920 Templin's academic position was professor of logic, ethics, and aesthetics; he taught large classes in those fields. He reduced his teaching in 1930 and retired from teaching altogether in 1937, but he continued as secretary of the Endowment Association until his death. The drive to raise funds to build the Stadium and the Memorial Union was successful, although the Union was not completed for a number of years [*The Graduate Magazine* 43]. Another accomplishment of Dean Templin was the establishment of the University's Summerfield Scholarships: Templin persuaded Solon E. Summerfield, a graduate of the University in the class of 1899, to give $20,000 annually to support the Summerfield Scholarships for outstanding men students from Kansas [*The Graduate Magazine* 48; Templin 16, 17]. Dean Templin succeeded also in obtaining many large gifts from Mrs. J. B. Watkins: Watkins and Miller Halls for women, Watkins Memorial Hospital, the Watkins Nurses' Home, the chancellor's residence, and the Watkins' farm lands (26,000 acres of wheat land in southwest Kansas) [*The Graduate Magazine* 51, 82]. Finally, Dean Templin obtained the gifts that provided a number of residence halls for self-supporting men (residence halls for self-supporting men and women are called "scholarship halls", and a student must have a good academic record to gain the privilege of living in one of them). Dean Templin personally obtained many outstanding gifts to the University; furthermore, his success in establishing the Endowment Association as a means of obtaining important private gifts and unrestricted funds is an enduring contribution to the welfare of the University and its students.

A university is no greater than its faculty, and one of the most frequently repeated themes in the history of the University from 1910 onward is the loss of important faculty members by resignation as a result of low salaries. In the beginning, the University was established in support of a cause [Hyder 1; *The Graduate Magazine* 1], and many able faculty members were attracted by the opportunity to work in support of this cause. Furthermore, the tradition established by this cause persisted beyond the pioneer period, although no completely adequate explanation has been offered for the distinguished faculty which made the University famous from 1890 to 1900 [Stouffer 1]. By 1910 the influence of the struggle for the abolition of slavery had disappeared, and there developed in its place a belief--epitomized by William Allen White's famous 1896 editorial entitled "What's the Matter with Kansas?"--that Kansas was an undesirable place to be. The special cause was gone, and henceforth the University had only the merits of its positions to attract scholars and administrators to its faculty. Unfortunately, after 1910, many of the University's positions lacked the merit of good salaries. For example, McClung, Kellogg, and other distinguished alumni wrote a series of articles in volume 11 (1912-1913) of *The Graduate Magazine* expressing their deep concern over the low salaries paid by the University and emphasizing the importance of a good salary scale for the welfare of the University [*The Graduate Magazine* 14]. Also, Professor Van der Vries complained bitterly to Dean Templin about the low salaries paid to members of the staff of the Department of Mathematics in the period 1913-1918, and Dean Templin in turn was equally forceful in demanding from Chancellor Strong better salaries for College faculty members [Templin 5]. Chancellor Strong, moreover, used every means at his command to obtain from the legislature better salaries for the faculty and better financial support for the University. Ephraim Miller published a series of three articles about members of the faculty who had resigned to accept positions elsewhere [Miller 17]. Furthermore, the report entitled *Survey of the State Institutions of Higher Learning in Kansas*, prepared by the U. S. Bureau of Education in 1923, carefully documented the University's low salary scale [*The Graduate Magazine* 26; Lindley 1]. The following are the names of some of the more conspicuous faculty members who resigned to accept positions elsewhere.

| | | |
|---|---|---|
| J. W. Young | 1911 | [Miller 17] |
| A. D. Pitcher | 1911 | [Appendix II] |
| W. H. Carruth | 1913 | [Carruth 2] |
| John N. Van der Vries | 1918 | [*The Graduate Magazine* 38, 69] |
| Erasmus Haworth | 1920 | [Haworth 1] |
| Dean Raymond A. Kent | 1923 | [*The Graduate Magazine* 71] |
| Dean Anne Dudley Blitz | 1923 | [*The Graduate Magazine* 71] |
| Dean F. J. Kelly | 1923 | [*The Graduate Magazine* 72; Stouffer 3] |
| Dean Harold L. Butler | 1923 | [*The Graduate Magazine* 72] |
| Dean W. H. Arant | 1928 | [*The Graduate Magazine* 70] |
| Earl N. Manchester<br>Director of Libraries | 1928 | [*The Graduate Magazine* 68] |

This list contains only a small sample of those who resigned, but the names in it are conspicous and significant. J. W. Young came in 1910 as Head of the Department of Mathematics, but he left at the end of one year and took A. D. Pitcher with him to Dartmouth. W. H. Carruth, seeing trouble ahead, accepted a position at Stanford University. John N. Van der Vries, Chairman of the Department of Mathematics, accepted a war-time position in business and never returned to the University. Erasmus Haworth resigned with a bitter letter of complaint about the low salaries paid to those who created wealth for the state. Four deans resigned in the spring of 1923. The Dean of the School of Law and the Director of Libraries resigned in the spring of 1928, and there were many more resignations. The chancellor's report made in January 1929 listed "a dozen members of the University of Kansas faculty who resigned the past year to accept positions at other universities at increases of 20 to 80 per cent over the pay at K. U." [*The Graduate Magazine* 47]. This statement described the situation shortly before the stock market crash of 1929; inevitably then, salaries were exceptionally low from 1930 to 1945.

This account of low salaries and resignations from the fauclty suggests that the legislature's appropriations for salaries and wages were low throughout the period from 1925 to 1945, and this was indeed the case. The following table, compiled from articles and reports in *The Graduate Magazine* [*The Graduate Magazine* 45, 47, 49, 50, 52-55, 63, 64, 66, 67, 73, and 80], shows that the appropriations for salaries and wages were constant from 1923-1924 through 1928-1929 and then rose exactly five per cent in 1929-1930. Also, the table shows that the appropriations were not cut --following the stock market crash in 1929--until 1933; actually, the first cut came in the year 1932-1933, as explained by the following statement made in December 1932: "It will be recalled that the Regents and other state officials worked out a plan whereby the state institutions of higher learning this current year use only 75 per cent of the money actually appropriated by the 1931 legislature" [*The Graduate Magazine* 52]. The annual appropriation for the biennium 1933-1935 was $615,000--a cut of 25 percent from $819,000. In order to balance its budget, the University cut salaries by 15 to 25 percent, and the chancellor's salary was cut 30 percent [*The Graduate Magazine* 55]. Later increases in appropriations for salaries and wages lagged badly behind increases in enrollment; not until 1943 did the appropriation equal the 1923 figure, and not until 1945 did it exceed the 1929 figure. With appropriations such as these, it is not surprising that the progress of the University was brought to a halt. The Mathematics Library, for example, was forced to cancel its subscriptions to a number of the world's leading mathematical journals. The Department is exceedingly fortunate that funds to fill the gaps created in the library's files of research journals were available later.

Table Showing Annual Appropriations by the Legislature for Salaries and Wages for The University of Kansas from 1923-1924 through 1946-1947, with Annual Enrollments from 1923-1924 through 1940-1941

| Academic Year | Appropriation for Salaries and Wages | Net Registration Regular Session |
|---|---|---|
| 1923-1924 | $780,000 | 3950 |
| 1924-1925 | 780,000 | 4210 |
| 1925-1926 | 780,000 | 4540 |
| 1926-1927 | 780,000 | 4439 |
| 1927-1928 | 780,000 | 4474 |
| 1928-1929 | 780,000 | 4453 |
| 1929-1930 | 819,000 | 4587 |
| 1930-1931 | 819,000 | 4658 |
| 1931-1932 | 819,000 | 4434 |
| 1932-1933 | 819,000 | 4281 |
| 1933-1934 | 615,000 | 4006 |
| 1934-1935 | 615,000 | 4268 |
| 1935-1936 | 615,000 | 4545 |
| 1936-1937 | 615,000 | 4921 |
| 1937-1938 | 675,000 | 4940 |
| 1938-1939 | 675,000 | 4878 |
| 1939-1940 | 710,000 | 4867 |
| 1940-1941 | 710,000 | 4577 |
| 1941-1942 | 766,000 | |
| 1942-1943 | 766,000 | |
| 1943-1944 | 808,970 | |
| 1944-1945 | 808,970 | |
| 1945-1946 | 977,218 | |
| 1946-1947 | 977,218 | |

The depression of the 1930s was world-wide in its effects, and in the United States it was far more destructive of life and property than World War II which followed. But in Kansas the depression was accompanied by the Dust Bowl era, a climatic variation in which there was extreme drought and heat. The

Dust Bowl was located in southwest Kansas and nearby areas in Oklahoma, Texas, New Mexico, and Colorado. This area, normally marginal in rainfall, had been plowed and planted in wheat. When the drought came, the spring winds blew the fine soil into black clouds that darkened the sky and boiled across the nation in great dust storms. On at least two occasions in Lawrence--March 20, 1935 and a day in March 1936--dust storms were so severe that day was turned into night; street lights and automobile headlights were turned on by two o'clock in the afternoon [Taft 1, pp. 145-147]. Furthermore, the summer of 1934 was one of exceptional heat. The University weather station reported fifty days when the temperature was 100° or higher, and sixteen of these days were consecutive! The official temperature was 114° at the end of the summer session. There was no air conditioning in 1934, and many Lawrence residents slept in their yards at night in an effort to escape the heat in their houses.

Kansas in the 1930's was still predominantly an agricultural state, and the world-wide depression and the local drought and Dust Bowl had disastrous effects on its economy. There had been times when the legislature did not support the University although it could well afford to do so; at the height of the depression and Dust Bowl era, however, the state suffered--along with its citizens--a severe shortage of funds.

The University of Kansas suffered not only from the economic and financial troubles of the 1930's, but also from the state's political fortunes. Kansas is normally a Republican and a conservative state. Alfred M. Landon, a graduate of the University in the class of 1908, was a candidate for President on the Republican ticket in 1936. He ran as an economy candidate in opposition to the spendthrift policies of Franklin D. Roosevelt. Roosevelt's WPA provided funds for public buildings and worth-while projects in an effort to create jobs and stimulate the economy. Many universities were able to construct valuable buildings on their campuses at this time with WPA funds, but Kansas did not participate in these benefits; to do so would have appeared to lend approval to policies of the opposition political party. Kansas paid taxes like other states, but it did not share equally in the benefits.

The University's history for the period from 1925 to 1945 reads like the end of an era, for during these years the University lost, through death, many of its most distinguished faculty members, alumni, and friends. The following is a partial list of those who died during this time.

| | | |
|---|---|---|
| 1926 | W. H. Carruth | [Carruth 4] |
| 1929 | E. E. Slosson | [Slosson 1] |
| 1929 | A. M. Wilcox | [Wilcox 1] |
| 1930 | W. H. Franklin | [Franklin, W. H. 2] |
| 1930 | Ephraim Miller | [Miller 10, 11] |
| 1931 | F. W. Blackmar | [Blackmar 1] |
| 1932 | Erasmus Haworth | [Haworth 2] |
| 1933 | E. H. S. Bailey | [Bailey 4] |
| 1933 | Joseph Granger Brandt | [*The Graduate Magazine* 56] |
| 1934 | Frank Strong | [*The Graduate Magazine* 60] |
| 1935 | F. H. Hodder | [Hodder 1] |
| 1936 | R. D. O'Leary | [O'Leary 1, 2] |
| 1936 | George C. Shaad | [Ashton 1] |
| 1936 | Charles Hamilton Ashton | [Ashton 1, 2] |
| 1936 | Charles Graham Dunlap | [Dunlap 1] |
| 1937 | E. C. Franklin | [Franklin, E. C. 3, 4] |
| 1937 | Vernon Kellogg | [Kellogg 2] |

| | | |
|---|---|---|
| 1939 | Elizabeth Miller Watkins | [*The Graduate Magazine* 82] |
| 1939 | James Naismith | [*The Graduate Magazine* 85] |
| 1940 | Rosemary Ketcham | [*The Graduate Magazine* 87] |
| 1940 | William E. Borah | [Distinguished Graduates of K. U. 15] |
| 1940 | Ernest Hiram Lindley | [Lindley 2, 3] |
| 1941 | Charles S. Skilton | [*The Graduate Magazine* 74] |
| 1941 | Alberta Corbin | [*The Graduate Magazine* 75] |
| 1941 | Amida Stanton | [*The Graduate Magazine* 86] |
| 1941 | Eugenie Galloo | [*The Graduate Magazine* 88, 89] |
| 1942 | U. G. Mitchell | [Mitchell 6] |
| 1942 | George O. Foster | [*The Graduate Magazine* 76] |
| 1942 | William Savage Johnson | [*The Graduate Magazine* 92] |
| 1943 | Alice Winston | [*The Graduate Magazine* 90] |
| 1943 | Carrie M. Watson | [*The Graduate Magazine* 78, 91] |
| 1943 | Olin Templin | [Templin 16, 17] |
| 1943 | H. P. Cady | [*The Graduate Magazine* 77] |
| 1943 | Miles Wilson Sterling | [Sterling 3] |
| 1944 | William Allen White | [*The Graduate Magazine* 79] |
| 1946 | William L. Burdick | [*The Graduate Magazine* 94] |
| 1946 | Edwin M. Hopkins | [*The Graduate Magazine* 94] |
| 1947 | Hannah Oliver | [*The Graduate Magazine* 93] |

This list, although incomplete, nevertheless contains the names of twelve of the twenty-five faculty members shown in a photograph of the University faculty made in 1891 or 1892 [*The Graduate Magazine* 83].

The passing of the University's faithful faculty members and long-time servants is emphasized by the frequent resolutions on their deaths which occur in the minutes of the University Senate. For example, the following resolution on the death of Professor Ephraim Miller was adopted at a senate meeting held on January 6, 1931 [Miller 18].

> With the death of Professor Ephraim Miller there passes one of the real founders of the University of Kansas. He began his service as a member of the teaching staff when the institution was yet in large degree a preparatory school. When he retired it was one of the recognized universities of the nation. Professor Miller had a large share in this development. He was a wise counsellor, a faithful supporter of administrative measures, a successful teacher, sympathetic, stimulating and just. Probably no other member of the faculty of the University has been held in higher regard by the students who attended his classes. The University and all its friends may well be grateful for his personality, the services and the memory of Professor Ephraim Miller.

The University of Kansas had become one of the distinguished universities of the nation during the administration of Chancellor Snow, and Chancellor Strong strove with all his might to continue the successes achieved by his predecessor. And progress was made: Frank Strong turned a small university into a large university with high national standing [Strong 2]. But it is hard to escape the feeling that the latter part of Chancellor Strong's administration brought a certain measure of defeat for the University: harsh management by the Board of Administration, inadequate financial support, and a faculty revolt. Financial support did not improve under Chancellor Lindley, and he was removed from his position by Governor Davis in 1924. Depression, the Dust Bowl era, and World War II followed. It is not surprising that the years from 1925 to 1945 were not a period of great enthusiasms and accomplishments and of promise for the future. To many it seemed that the great days of the University were in the past [Stouffer 1]. Few failed to realize that the University was passing through a period of decline; many, however, carried on faithfully in the belief that a better day would come.

The Department of Mathematics shared the fortunes of the University. After the stormy period from 1910 to 1920, the leaders in the Department--Professors Ashton (chairman from 1918 to 1931), Mitchell, and Stouffer--sought above all else to establish peace, stability, and tranquillity. They succeeded to a remarkable degree, and the favorite boast of the Department became the long years of service of the members of its staff. For example, when Professor Wheeler retired in 1947, the Department pointed out that the total years of service of six members of its staff (Jordan, Wheeler, Stouffer, Black, Smith, and Babcock) amounted at that time to 181 years [Wheeler 5].

Professor Charles Hamilton Ashton joined the Department in 1903. He received his Ph.D. degree from the University of Munich in 1909, but he remained a teacher rather than a research mathematician. He was appointed chairman in 1918, but heart trouble forced him to resign from this position in 1931. Ashton died in Seattle, Washington, on August 3, 1936. Professor Mitchell wrote an account of Ashton's life and work for *The Graduate Magazine* and also the senate resolution in his memory [Ashton 2, 3]; they contain a full account of Professor Ashton's life and of his university activities [S, ch. 4, secs. 1, 2].

Professor U. G. Mitchell had been a school teacher before he entered The University of Kansas. The University catalog for 1904-1905 tells us that he received an A.B. degree from Central Normal College in 1898, but the accounts of his life tell us little about this school, where it was located or about his attendance there. He had three academic interests: mathematics, the training of teachers of mathematics, and the history of mathematics. Eventually he became the University's leading committeeman. The following account of Mitchell's activities appeared in *The Graduate Magazine* for October 1923 [Mitchell 4].

Whenever a faculty committee is proposed for the purpose of really accomplishing something, someone is fairly certain to suggest:

"Mitchell ought to be on that committee."

Then the suggestion is accepted and Ulysses Grant Mitchell, '06, professor in the department of mathematics, goes on either as chairman or ranking member. Mr. Mitchell was asked to give the "low down" on this continuous experience. He agreed to the request, with the proviso that no one must consider he is objecting. His statement was something as follows:

"During the regular term time something like 11 (be the same more or less) standing committees and some 17 (likewise more or less) special committees continually invite me to spend all of the time which I need for golf and most of the time which I need for sleep, working for the good of the country. Realizing that one should help carry a full share of the overhead in the University, I attend a good many committee meetings and manage to have a pretty good time by talking most of the time. Incidentally, I contrive to spend several hours per day five days in the week trying to lead young men and women to see some of the beauties as well as the useful applications of mathematics. Vision of students in this respect materially defective-some nearly blind! Observation leads me to believe however, that the co-efficient of intellectual impenetrability to mathematical concepts has not changed perceptibly in the last twenty years."

Mr. Mitchell was speaking a few days after school started and he was asked to tell of his then strenuous duties as chairman of senior advisors.

"We devote our principal energies trying to find ways for third, fourth, and fifth year students to keep a majority of the faculty rules unbroken, limit the number of 'snap' courses to less than fifty per cent of the total program at any one time, avoid nervous breakdowns from overstudy and escape at the end of the year with the desired diploma and the more or less vigorous plaudits of the faculty," Mr. Mitchell explained.

Concerning the activities and the time which he calls his own, Mr. Mitchell might be quoted to the following effect:

"Have spent considerable time during the last year trying to discover some new truths in the theory of numbers with just enough success to keep active my desire to spend most of my time working at it. Have for several years been working at odd times on an elementary algebra which seems likely at the present time to be completed before the expiration of my life expectancy as indicated by mortality tables."

And in conclusion: "Am still optimistic enough to believe that the University has a wonderful future of service ahead of it. Still go to church with a fair degree of regularity in an attempt to stay in communication with my conscience."

Professor Mitchell became chairman of the Department in 1931 when Professor Ashton was forced to resign. It is doubtful that the new position made any great change in Mitchell's activities. His office was located in 205 Frank Strong Hall (called the Administration Building at that time); this room served as the Department's headquarters for many years.

During the spring semester of 1932, Professor Mitchell was on leave [Mitchell 2], pursuing his interest in the history of mathematics and early books on mathematics. He and Mrs. Mitchell spent the spring of 1932 at Columbia University where David Eugene Smith, a specialist on the history of mathematics, had gathered a library of early books on mathematics. Professor and Mrs. Mitchell spent the summer in Europe, and there he collected many of the early books and rare books on mathematics which he later gave to the Mathematics library. Professor Mitchell's collection of books (dispersed, unfortunately!) is now in Spencer Memorial Library.

But Professor Mitchell was best known as a kindly and sympathetic teacher. He was widely known by students and alumni, by members of the faculty, and by residents of Lawrence and of the state. The frequency with which articles about him appeared in the newspapers and in *The Graduate Magazine* is an indication of the widespread affection in which he was held. (See, for example, *The Graduate Magazine* of December 1934 [Mitchell 3; S, ch. 4, sec. 3].)

An article in *The Graduate Magazine* for January 1941 [Mitchell 5] announced

Professor Mitchell's retirement as Chairman of the Department and described his services to the University as follows.

> Why not give a place on this page to one of K.U.'s sons who has remained on the campus and devoted 34 years of splendid service to the upbuilding of the University!.... U. G. Mitchell, '06, g'07, retires at this time from the chairmanship of the department of mathematics, and takes a semester leave to return next fall to continue as one of the University's finest teachers. A banquet in honor of him and Mrs. Mitchell was held Jan. 31 with nearly 200 of their friends gathered to do them honor. They may remain in Lawrence during the spring months or they may go near some other University if they can find library facilities suitable to his needs. Professor Mitchell plans to do some writing..... This all-around man took his undergraduate work in history and taught the subject two years at the University before doing graduate work at Kansas and at Princeton in mathematics. He is still interested in the historical aspect of numbers and of mathematics. He is the author of many learned papers and books..... Under a new rule department heads uniformly resign at age of 65. Professor Mitchell is 68. Dean E. B. Stouffer of the Graduate School will act as head of the mathematics department..... Professor Mitchell has been one of the University's most active and able committeemen. Jobs that bored other good teachers have appealed to him as problems to be solved and he has carried them through patiently, loyally, efficiently. An offhand review of some of the major committees of which he has been chairman shows a total of 28, with 18 others of which he has been an active member. The astonishing list reveals a varied and potent influence on the operation of the University. Here are some of them, without any attempt at chronological order or order of importance. He has been chairman of the following committees, among others: 75th Anniversary, Commencement (10 years), University Survey (held 67 meetings over 2-year period), Red Cross, Liberty Loan and United War Work campaigns, Lindley Inaugural, Aids and Awards and several special loan and scholarship funds, Assignment of Quarters, Organization of First Operation of Memorial Union, Relationships with other Educational Institutions, Faculty Committee of School of Religion--and many others. Some of the other committees of which he has been a member include Advanced Standing, Joint Committee on Student Affairs, Publication of Science Bulletin, Selection of Chancellor in 1920, Retirement Plans, Summerfield Scholarships, (sec'y. for 10 years).

Professor Mitchell's retirement dinner, held January 31, 1941, was the most impressive one ever held by the department. About two hundred guests attended; the old Kansas Room in the Memorial Union was crowded to capacity. A local newspaper described the dinner [Mitchell 11]:

> Citizens of Lawrence, University of Kansas officials and out of town friends met . . . to honor Prof. and Mrs. U. G. Mitchell. . . . Many of the guests were former students of Prof. Mitchell.
>
> In honor of his service as head of the mathematics department a gift of a $100 scholarship in the department is being established for the years '41 and '42.
>
> Prof. and Mrs. Mitchell have hundreds of friends throughout the city of Lawrence. They came here during a period when it was popular for university professors to form acquaintances throughout the city and have never given up that custom. They are highly respected throughout the community, taking an active part in civic and church affairs.

Professor Mitchell was not well; as a result, he took leave, and he and Mrs. Mitchell spent the spring semester of 1941 in Pasadena, California. They returned to Lawrence, however, and Professor Mitchell took up his teaching again in September. He was not able to complete the semester, however, for early on the morning of January 1, 1942, he died suddenly from a heart attack. Accounts of his death and funeral were widely published in newspapers across the state [Mitchell 12-16]. *The Graduate Magazine* published the following account of his death and of his life's work [Mitchell 6].

> Prof. U. G. Mitchell, '06, g'07, was taken suddenly by a heart ailment, his unexpected death occurring early the morning of Jan. 1. His close friends knew that he had been affected by heart trouble for many years and Mrs. Mitchell realized how he was failing during

the last few months. But the shock of his passing was a hard one, even so.

Ulysses Grant Mitchell came to Kansas from Iowa in 1885 at the age of 12. His family traveled in a prairie schooner. At the age of 13 he was herding as many as 160 head of cattle at a time on the plains near Peabody. After graduation from high school he taught country school three years and then attended the University of Nebraska a year. There followed three years of attending a normal school where he taught mathematics and German while he studied other subjects. After six years as superintendent of schools at Hillsboro and Lyons he entered the University of Kansas in 1904. His major interest had turned to history and he was called on to teach the first course in American government at K.U. in 1905.

Professor Mitchell became head of the mathematics department in 1931 and retired from that position at the end of the semester, February, 1941. A great banquet was given in his honor with more than 200 friends of the University and from other parts of Kansas gathering to pay tribute.

Dr. Mitchell was a fine scholar and was high in the councils of state and national mathematical societies. He was an excellent teacher and a good friend and counselor of his students. He was one of the University's most public spirited and able administrative leaders.

In the last World War he made a widespread reputation as a Red Cross campaign leader. He was chairman of the Lindley inaugural ceremonies in 1921. For ten years he was Commencement chairman. For many years he was chairman of the committee on relations with other educational institutions. His work on the junior college committee, at a time when junior colleges were getting started in Kansas was highly beneficial to the junior colleges and to the University. In the 1930's he was drafted to be chairman of the committee which made an exhaustive survey of the internal organization of the University. His last assignment was that of general chairman of the 75th Anniversary Celebration for the entire two-and-a-half-year period of the observance, covering more than five events. His wisdom in laying out general plans made that a great success. He was almost solely responsible for getting the publication of a history into the budget for the event.

His unique place in the life of the University can never be filled. As in the case of many great spirits, it will taken two or three men to exert the influences that he exerted.

Mrs. Mitchell, whom he met in the eighth grade at Peabody where the two were competitors for the leadership of the class, and whom he married at the time of starting work as a school superintendent, survives him. She remains at their home at 1313 Mass. St.

The University Senate, at a meeting held on March 3, 1942, adopted the following resolution in memory of Professor Mitchell [Mitchell 7].

The Senate of the University of Kansas desires to record in these resolutions its profound sense of loss in the death of Professor Ulysses Grant Mitchell on January 1, 1942.

Professor Mitchell became a member of the University faculty in 1906, and of the Senate in 1915. For more than a quarter of a century he took a leading part in the activities of that body. During this period he was respected by his colleagues as unusually well-informed, faithful and dependable. He served on many of the most important Senate committees, often as chairman, and was always deeply concerned with the details of university procedure and faculty relations. As chairman of the Committee on Place and Functions of the Senate, of the University Survey Committee, and of the Committee on Aids and Awards, he performed services of notable value.

Still more important than his administrative work in the eyes of Professor Mitchell himself was his function as a college teacher. His fine scholarship and his high ability as an instructor were combined with a transcendent interest in his students as individuals. With many of these students and with others throughout the state he kept up his relationship by active correspondence, attendance at meetings of teachers, and numerous visits to high schools. These activities were not performed as duties; they were for him the natural expression of a sincere interest in teaching and in those who were being taught.

In his private relations Professor Mitchell joined a quiet dignity with friendliness, approachableness and an optimistic outlook. His ardent desire for the improvement of the University was unhampered by any feeling of discouragement as to the conditions under which he might be working. He was a man who could be absolutely trusted. The fact that he was so often elected to important offices is an evidence of this trust. In the conduct of these offices his attitude was serenely impersonal. He took a firm stand on questions that he thought important, but always with good humor and tolerance for opposing opinions. His colleagues in the Senate will remember him first as a faithful friend, and then as a wise molder of University opinion and shaper of University institutions through these forces of quiet persuasion and gradual evolution in which he so strongly believed.

Committee: Wealthy Babcock
E. H. Hollands
W. S. Johnson

Professor Herbert E. Jordan was first appointed to the staff of the Department in 1911 [Wheeler 1]. He never engaged in research, but throughout his career he was one of the Department's faithful teachers. Professor Jordan usually taught an applied course that was designed to be of special interest to students in the School of Engineering. The Department's report for 1913-1914 shows that Professor Jordan was a member of the Committee on Census and Records for that year; and he kept the Department's records--so necessary for the scheduling of courses in future semesters--from that time until his retirement in 1948. As a young man Professor Jordan had hoped to become a minister; he remained an active and faithful member of his church throughout his life.

Professor John J. Wheeler also was first appointed to the staff of the Department in 1911 [Wheeler 1]. He was a teacher throughout his career. He was appointed University marshal in 1916, and he held this position until shortly before his retirement in 1947 [Wheeler 2, 4]. Photographs of Wheeler and comments on his activities were published frequently in *The Graduate Magazine* in connection with accounts of commencements [Wheeler 3, 7].

Professor Guy W. Smith, appointed to the staff of the Department in 1920, was interested in sound teaching (the students called him "hard-boiled" Smith) and in sports and athletics. He served on numerous University committees, but these services have gone unrecorded, perhaps because they were overshadowed by those of Professor Mitchell. During the 1930's and 1940's Professor Smith was an unofficial assistant to the chairman in scheduling courses and handling student problems. After World War II he served as the Department's chairman for five years; a more detailed account of him will be given in the next chapter.

Professor Ellis B. Stouffer was appointed to the staff in 1914 [Stouffer 2]. He had received his Ph.D. degree from the University of Illinois in 1911; his thesis, on a problem in projective differential geometry, was supervised by

Professor E. J. Wilczynski. After Professor Lefschetz's departure, Professor Stouffer was the only research mathematician left in the Department. He wrote a total of twenty research papers [see S, Appendix VI for an account of Dean Stouffer's research and activities in mathematics], and he probably would have accomplished much more had not his special administrative talents interfered. The Department of Mathematics had recognized early that Stouffer had unusually sound judgment; in 1922 he was appointed Dean of the Graduate School to succeed Dean F. W. Blackmar, and in 1923 he was made assistant to the chancellor and chairman of the Budget Committee [Stouffer 3]. Dean Stouffer was assistant to the chancellor only until 1926, but he continued as Dean of the Graduate School until 1946; from 1946 to 1950 he was Dean of the University. He was chairman of the Budget Committee from 1923 to 1950, and this position subjected him to a heavy burden during the difficult years of the depression in the 1930's. Dean Stouffer received a Guggenheim Fellowship in 1926, and he spent the academic year 1926-1927 studying Italian geometry in Bologna, Italy. He carried on his research remarkably well while he had a heavy load of administrative duties, but eventually these and his health forced him to give up his research--he published none after about 1932. Dean Stouffer became Chairman of the Department of Mathematics when Professor Mitchell resigned in January 1941.

The members of the Department's staff during the 1925-1945 period had unusually small families, and nearly all of the children were girls. In an earlier period, Professor Ephraim Miller had four children, three daughters and a son [Miller 10, 19] and Professor Henry Byron Newson had three, two daughters and a son (the son was born only a few months before Newson's death). In 1935, however, the total senior staff of eight faculty members had only seven children. Professor Ashton had two daughters; Professor Wheeler had a son and a daughter; Professors Stouffer, Jordan, and Smith had one daughter each; and Professor

Mitchell had no children. Professors Bell, Price, and Ulmer, who joined the staff near the end of the period covered by this chapter, had large families later, but even then nearly all of their children were girls.

The list of courses in mathematics in the 1927-1928 University catalog forms a convenient background for describing the Department's program between 1925 and 1945. The year 1927-1928 has been chosen because this was the first year in which courses were numbered according to the system still in use in 1971. The following list contains all mathematics courses listed in the 1927-1928 catalog (the number in parentheses indicates the number of semester hours of credit a student received for taking the course).

| | | |
|---|---|---|
| 1. | Solid Geometry (2) | |
| 2a. | College Algebra (3) | |
| 2b. | College Algebra (5) | |
| 2E. | College Algebra (5) | |
| 3a. | Plane Trigonometry (2) | |
| 3b. | Plane Trigonometry (3) | |
| 4. | Analytical Geometry I. (2) | Ashton, Mitchell. |
| 4E. | Analytical Geometry (5) | Wheeler, Black, Babcock. |
| 5. | Differential Calculus (3) | Ashton, Mitchell. |
| 5E. | Calculus I. (4) | Jordan, Wheeler, Smith, Black. |
| 6. | Analytical Geometry II. (2) | Ashton, Mitchell. |
| 7. | Integral Calculus (3) | Ashton, Mitchell. |
| 7E. | Calculus II. (4) | Jordan, Wheeler, Smith. |
| 9. | Solid Analytical Geometry (2) | |
| 10. | Mathematical Theory of Investment (2) | Jordan, Smith. |
| 11. | Theory of Equations (3) | Mitchell. |
| 70. | Survey Course in Mathematics (3) | Mitchell. |
| 150. | Analytical Mechanics (3) | Smith. |
| 151. | Differential Equations (3) | Smith. |
| 152. | Advanced Calculus (3) | Ashton. |
| 153. | Modern Analytical Geometry (2) | Smith. |
| 154. | Modern Synthetic Geometry (3) | Ashton. |
| 155. | Series (2) | Ashton. |
| 157. | Complex Numbers (3) | Ashton. |
| 159. | Projective Geometry I. (3) | Mitchell. |
| 160. | Projective Geometry II. (3) | Mitchell. |
| 161. | Higher Plane Curves (3) | Smith. |
| 162. | History of Mathematics (2) | Mitchell. |
| 163. | Mathematical Theory of Statistics (2) | |
| 167. | Selected Topics in Engineering Mathematics (3) | Jordan. |

| | | |
|---|---|---|
| 300. | Theory of Functions of a Complex Variable (3) | Ashton. |
| 301. | Theory of Functions of a Real Variable (3) | Mitchell. |
| 302. | Theory of Elliptic Functions (3) | Ashton. |
| 303. | Seminar (3-5) | Ashton, Mitchell, Stouffer. |
| 307. | Higher Algebra (3) | Mitchell. |
| 308. | Galois' Theory of Equations (3) | Ashton. |
| 311. | Differential Geometry (2) | Stouffer. |
| 313. | Advanced Projective Geometry (3) | Mitchell. |
| 314. | Fourier's Series (3) | Ashton. |
| 315. | Projective Differential Geometry (3) | Stouffer. |
| 321. | Theory of Numbers (3) | Mitchell. |

Since the beginning of this century the Department has found it necessary to offer remedial courses in high school mathematics. Mathematics 1, Solid Geometry, is listed among the courses in the 1903-1904 University catalog; it continued to be listed, except for occasional omissions, through 1927-1928. From 1933-1934 through 1941-1942 the catalogs list Mathematics 1, General Mathematics, the prerequisite for which was one year of high school mathematics. From 1927-1928 through 1939-1940 the catalogs list Mathematics 70, Survey Course in Mathematics; Professor Mitchell taught it as a terminal course for liberal arts students who had had two years of high school mathematics. High School preparation in mathematics deteriorated during the 1930's, and the Department found it necessary to introduce Mathematics 2, Intermediate Algebra, which was listed for the first time in the 1940-1941 catalog. The Department anticipated post-war problems by introducing Mathematics 0, Plane Geometry, which appeared for the first time in the 1944-1945 catalog.

Professor Lefschetz has pointed out [Lefschetz 1; S, Appendix V] that the University had essentially two departments of mathematics when he arrived in Lawrence; one served the School of Engineering and the other, the rest of the University. This division in the Department was emphasized in the beginning by office locations. In 1910-1911, Professor Young had his office in Blake

Hall, Professors Mitchell and White were located in Fraser Hall, and the other five members of the staff had offices in Marvin Hall. A little later the staff had offices in Strong Hall and Marvin Hall, and finally all members of the Department were located in the east wing of Strong Hall. Even then, as the list of courses emphasizes, there were still special courses for engineering students: courses 2E, 4E, 5E, and 7E were for engineering students only. Mathematics 150, Analytical Mechanics, was certainly intended primarily for engineers, and Professor Jordan's Mathematics 167, Selected Topics in Engineering Mathematics, was designed solely for them.

A large part of the work of the Department of Mathematics consists of service courses for students in other fields; the major service load was for students in physics and engineering, but the Department began early to offer one course for students interested in business. This course is listed in the 1914-1915 and the 1915-1916 catalogs as Mathematics 10, Probability and Statistics; beginning in 1916-1917, however, its title was Mathematical Theory of Investment. In 1962 this course was dropped and replaced by other courses more significant for business students.

In the early 1920s, the department offered only a single course in statistics. The 1920-1921 catalog lists for the first time Mathematics 63, Mathematical Theory of Statistics; this course--quite elementary in spite of its name--was designed to be of interest to students in the biological sciences, economics, and psychology. Mathematics 63 is not listed in the catalogs for 1921-1922 and 1922-1923, but it reappears in the 1923-1924 catalog with Helen Walker as instructor (later, at Teachers' College, Columbia, Helen Walker was known for her work in statistics). Course 63 became 163, Mathematical Theory of Statistics, in the renumbering of courses in 1927-1928, and it continued to be taught until after World War II. Professor J. J. Wheeler was listed as the instructor for Mathematics 163 for the first time in 1931-1932, and he remained its instructor until 1945. The catalog for 1944-1945 lists G. B. Price as the instructor for Mathematics 163 in recognition of his war-time experience in operations research [see S, Appendix VIII]. In the period 1945-1950 Price developed the Department's first significant program in statistics.

The education of teachers of mathematics has always been one of the important functions of the Department of Mathematics. Professor Newson taught a teachers' course for mathematics students before 1900. As discussed in chapter 3, Professor Mitchell was especially active in teacher education during the period from 1910 to 1925; he continued his interest and his active participation until his death in 1942. The catalog for 1911-1912 is the first to list a separate course in the history of mathematics, although the subject was one part of Professor Newson's teachers' course. The 1919-1920 catalog lists Mathematics 62, History of Mathematics; this course was renumbered 162 in the 1927-1928 catalog. Mathematics 162 was of special interest to Professor Mitchell, for he taught it so that it combined his three interests, namely, mathematics, history, and teacher education. The catalog for 1920-1921 lists Mathematics 89, Teachers' Course in Mathematics, with Professor Mitchell as instructor. The next year this course was listed under Education, but Professor Mitchell continued as its instructor. The catalog for 1937-1938 lists Mathematics 164, Field Work in Mathematics, with Gilbert Ulmer as instructor. This was specifically a teacher's course, designed to supply motivation for the study of mathematics and to provide some practical applications through the study of surveying and the use of surveying instruments. Although the number of special courses for teachers was not large, many of the Department's courses in algebra and geometry were taught with special attention to the interests and needs of future teachers.

The evidence indicates that the Department's courses in analysis, at least until 1937, were routine and classical. There were the usual elementary courses in calculus, advanced calculus, and differential equations; advanced courses in analysis consisted of complex variables, real variables, elliptic functions, and Fourier series. The catalog for 1931-1932 lists a new course, Mathematics 310, Advanced Differential Equations, but there is no evidence that this course had any significance. Courses in the calculus of variations and in algebraic functions had been listed occasionally in catalogs in the past, but these courses do not appear between 1925 and 1945. The Department's courses in analysis were far from modern, and they lacked mathematical strength and significance.

From 1925 to 1940 the Department's program in algebra consisted largely of Mathematics 11, Theory of Equations (renumbered Mathematics 156 in 1936-1937), and Mathematics 307, (Bôcher's) Higher Algebra. Other courses are listed in the catalogs, but they also were classical and apparently did not contribute to an active and significant program in algebra. From 1903-1904 through 1941-1942 the catalogs list a course entitled Galois' Theory of Equations; it is Mathematics 308 in the 1941-1942 catalog. Mathematics 304, Lie's Theory, is listed in the catalogs from 1928-1929 through 1935-1936. Mathematics 306, Theory of Finite Groups, is listed for the first time in 1934-1935; this course became important after W. R. Scott joined the Department in 1949, but it had no significance until then. As in the case of analysis, the Department's courses in algebra were routine and classical. The situation could hardly have been otherwise, for the staff contained no one trained in algebra and who was following the developments in abstract algebra that were taking place so rapidly at that time.

There were many undergraduate courses in geometry: 153, Modern Analytical Geometry; 154, Modern Synthetic Geometry; 159 and 160, Projective Geometry I and II; and 161, Higher Plane Curves. Also, there was a graduate course in

Advanced Projective Geometry. These courses were classical and not significant for the future, although they did contribute to the teacher education program at the time.

There were two graduate courses in geometry, however, that were more significant. The following is the description of a new course in the 1910-1911 catalog (J. W. Young was Head of the Department that year):

> 111. Differential Geometry. Two hours, throughout the year, by appointment. Applications of the calculus to the theory of curves and surfaces. To be given in 1911-1912. Assistant Professor Mitchell.

This course, with the same description but with Dean Stouffer as instructor, was numbered 311 beginning with the 1927-1928 catalog. Dean Stouffer joined the Department's staff in 1914, and another new course appeared in the 1914-1915 catalog for the first time; the 1927-1928 catalog gives the following description of this course:

> 315. Projective Differential Geometry. Three hours credit. Throughout the year. Invariants and covariants; projective differential geometry of curves and surfaces. Stouffer.

Dean Stouffer built his program of graduate work and research around Mathematics 311 and 315, Differential Geometry and Projective Differential Geometry. As a part of this program Dean Stouffer supervised the theses of three students who received Ph.D. degrees from the Department.

Miss Florence Lucile Black received three degrees from The University of Kansas: A.B. in 1913, M.A. in 1921, and Ph.D. in 1926. She was an Instructor in Mathematics from 1918 to 1926, an Assistant Professor from 1926 to 1940, and an Associate Professor from 1940 to 1960, when she retired from active teaching. Her Ph.D. thesis, entitled "A Reduced System of Differential Equations for the Invariants of Ternary Forms", was supervised by Dean Stouffer; it was published in the *Kansas University Science Bulletin*, vol. 19 (1929), November, no. 2, pp. 17-25.

Professor Black spent her early life on a cattle ranch in western Kansas; reminiscences of this part of her life appear in Appendix VII of the Supplemental Volume. Her brother was the distinguished engineer E. B. Black, of the firm of Black and Veatch in Kansas City [Distinguished Graduates of K. U. 5, 8, 16, 17]. Professor Black was widely known as a loyal alumna and faculty member and as a lover of sports and the outdoor life [Black 2, 3, 5, 6]; she was beloved by many generations of students as a sympathetic and excellent teacher. She served for many years as secretary of the college faculty. The following tribute appeared in *The Graduate Magazine* [Black 1].

> "A good scout, an able teacher of mathematics, a fine citizen of the University community." That's about the way anybody on the Hill, be it student or faculty member, would describe Miss Florence Black, '13, g'22, Ph.D.'26, associate professor of mathematics.
>
> Doubtless mention of a University teacher should at least begin with her classroom work and scholarly activities--and Miss Black ranks with the best in that particular orbit--but one sees and hears so much about her as a living, active member of life on the Hill outside the class room that she is often thought of first in that light.
>
> Do the Jay Janes need a chaperon for a trip to the football game in Lincoln or Columbia? Miss Black will go, gladly. And she is one grand member of the party too. Is there a dull student (maybe an athlete) who needs some math problems explained? Miss Black is willing to aid. Does the Commencement committee need a chairman of decorations? She does it beautifully. Is there a role to be enacted at the University club pageant? She can do it.

Florence Black is a great out-door woman. Fall and spring afternoons see her much on horseback. None can broil a steak over a picnic fire better than she. Swimming and tennis she likes, too. In summers she is away in her car, which she always names "Algebraic Analytic" or "Algie Ann" for short, to the mountains or the desert, camping out, sleeping on the ground, living the life of a gypsy in boots and trousers. Miss Black is a great friend of the Bunns, Bonnie Huff and John Bunn, now of Stanford University. Many of her summers have been spent with them, or just with Bonnie while Dean John studies or carries on his official duties. Two years ago the three of them had a thrilling escape from shipwreck on an Alaskan trip.

Miss Black gets a lot of humor out of memory of being offered a quarter by a filling station boy for waiting so patiently while he was held off from her car by a swarm of other business. She thinks it miraculous that a school teacher should be paid for her patience.

Miss Wealthy Babcock (her real name was Wealthea Consuelo Babcock) also received three degrees from The University of Kansas: A.B. in 1919, M.A. in 1922, and Ph.D. in 1926. She was an Instructor in Mathematics from 1920 to 1926, an Assistant Professor from 1926 to 1940, and an Associate Professor from 1940 to 1966, when she retired from active teaching. Her Ph.D. thesis, entitled "On the Geometry Associated with Certain Determinants with Linear Elements", was supervised by Dean Stouffer; it was published in the *Kansas University Science Bulletin*, vol. 19 (1929), November, no. 3, pp. 27-42.

Professor Babcock was known as an outstanding teacher; she was known also for her interest in sports [Black 6] and in the outdoor life: she always owned a stable of horses which she and Professor Black rode. For many years Professor Babcock owned four acres (which included a house, barn, and pasture) at the corner of 23rd and Alabama Streets where the John Haddock Ford automobile agency is now located. She was for more than thirty years the Department's librarian, a devoted service in recognition of which the Department named its library the Wealthy Babcock Library in 1964. Also, Professor Babcock served for many years on the University's scholarship committees--the committees that read countless applications for scholarships and award the limited funds available. Professor Babcock appears in a faculty group photograph made in 1953 [*The Graduate Magazine* 42].

Professor Ronald G. Smith also received three degrees from The University of Kansas: A.B. in 1924, M.A. in 1926, and Ph.D. in 1930. He was an assistant instructor in the Department during 1924-1926, and an instructor during 1926-1927 and 1928-1930. His thesis, entitled "A Canonical Form For The Differential Equations Of Curves In n-Dimensional Space", was supervised by Dean Stouffer; this thesis was never published. (The biography of R. G. Smith from the Eleventh Edition, 1967, of *American Men of Science* appears in Appendix IX.) For many years Professor Smith was Chairman of the Department of Mathematics of Kansas State College at Pittsburg.

The Department of Mathematics produced no further Ph.D. degrees before 1945. Thus, the total number of Ph.D. degrees produced by the Department from 1866 to 1945 was six; these degrees were received by Arnold Emch (1895), Arthur Bowes Frizell (1910), Robert Spencer Pond (1910), Florence Black (1926), Wealthy Babcock (1926), and Ronald Gibson Smith (1930).

Professors Black and Babcock became assistant professors in the Department when they received their doctorates in 1926. The next significant addition to the staff was Dr. Philip O. Bell, who was appointed to an instructorship in 1936. Dr. Bell received two degrees from The University of Kansas: an A.B. in 1930 and an M.A. in 1932. He received his Ph.D. degree from Berkeley in 1936. While he was still a student at K. U., Bell learned differential geometry and projective differential geometry from Dean Stouffer; his later research was in these two fields. Furthermore, Professor Bell gradually took over Dean Stouffer's graduate courses in differential geometry and projective differential geometry: Bell was listed as the instructor for Mathematics 315, Projective Differential

Geometry, for the first time in the 1940-1941 catalog; he was listed as the instructor for Mathematics 311, Differential Geometry, for the first time in the 1946-1947 catalog. Professor Bell's wife died from cancer early in the 1950's; his second wife was not happy in Lawrence, and he resigned in 1955 and entered industry. (Professor Bell's biography from the Eleventh Edition, 1965, of *American Men of Science* appears in Appendix IX.)

Gilbert Ulmer was born in Alexandria, Indiana, on October 27, 1903. He studied mechanical engineering at Purdue University between 1922 and 1925, and he studied mathematics and physics at Butler University between 1927 and 1931. From 1928 to 1930, however, he taught mathematics in a junior high school in Beckley, West Virginia. He received his A.B. degree from Butler University in 1931 and entered The University of Kansas the same year. He received his M.A. degree, in mathematics, in 1933; he wrote a thesis on a topic in projective differential geometry under the supervision of Dean E. B. Stouffer. He was a student at the University of Chicago in the summers of 1933 and 1934 and at Columbia University in the summer of 1937. He received the Ph.D. degree in mathematics education from The University of Kansas in 1939; Professor Mitchell was the member of his dissertation committee from the Department of Mathematics.

Gilbert Ulmer was an Assistant Instructor in Mathematics from 1931 to 1934, an Instructor in Education from 1934 to 1939, and an Assistant Professor of Education and Mathematics from 1939 to 1941. In 1941 he was appointed Assistant Professor of the Teaching of Mathematics and also Assistant Dean of the College of Liberal Arts and Sciences. From 1944 to 1956 he was Associate Professor of the Teaching of Mathematics and Assistant Dean of the College of Liberal Arts and Sciences; from 1956 to 1967 he was Professor of the Teaching of Mathematics and Assistant Dean of the College; from 1967 to 1969 he was Professor of the Teaching of Mathematics and Associate Dean of the College. He retired from his position as Associate Dean in 1969, and he became Professor Emeritus in 1974.

Dean Ulmer taught mathematics courses in the Department of Mathematics and "methods" courses on the teaching of mathematics in the School of Education. Furthermore, he supervised master's and doctoral theses in education and he supervised students engaged in practice teaching in mathematics. Continuing the work begun by Professor Mitchell, Dean Ulmer was the member of the Department responsible for the training of teachers of mathematics. For many years he was editor of the *Bulletin of the Kansas Association of Teachers of Mathematics*. Dean Ulmer served under Dean Paul B. Lawson and Dean George R. Waggoner in the College office; as Assistant and Associate Dean, he supervised the faculty advising system in the College. He was a member of the Administrative Committee, and he dealt with a wide range of academic problems of students in the College. He played an important role in the life of the University [*The Graduate Magazine* 95, 96].

I received my Ph.D. degree from Harvard University in 1932; my thesis on dynamical systems was supervised by George David Birkhoff. Positions were exceptionally scarce, but I held instructorships at Union College in Schenectady during 1932-1933 and at the University of Rochester during 1933-1936. I spent the year 1936-1937 as an instructor at Brown University; Brown's Dean R. G. D. Richardson was Secretary of the American Mathematical Society [Archibald 1]. Because they both were deans of graduate schools, Dean Richardson and Dean E. B. Stouffer were well acquainted; in addition, they were warm friends. Dean Richardson recommended me when the K. U. Department sought another mathematician. Dean Stouffer and Professor Mitchell interviewed me at the Christmas meetings of the mathematicians in 1936; I was offered, and accepted, an Assistant Professorship without a visit to the campus. I had never been in the State of Kansas, but Dean Richardson's recommendation of Dean Stouffer was very strong.

In those days the group of mathematicians was very small, and Dean Richardson--through his position as Secretary of the American Mathematical Society--functioned very effectively as a one-man placement bureau.

During my year at Brown University, I attended a course of lectures by Professor Jacob David Tamarkin; these lectures included an extensive treatment of topological spaces, metric spaces, linear spaces, and related topics. During my first year at Kansas (1937-1938), I taught Mathematics 301, Theory of Functions of a Real Variable, during both semesters. The Department's records show that, during the first semester, the course met two hours per week and had an enrollment of six students (four men and two women). Hardy's *Pure Mathematics* was used as a textbook, at least during the first semester. During the second semester the course met three hours each week; only the four men were enrolled. During the second semester I presented in lectures some of the material on topology and abstract spaces from Professor Tamarkin's course at Brown. This new material presented in Mathematics 301 during 1937-1938 is an important milestone, because it was the beginning of modern mathematics (as it is known today) in the Department. Furthermore, the new material in Mathematics 301 led immediately to a new course, listed for the first time in the 1938-1939 catalog with the following description:

> Mathematics 302. Introduction to the Theory of Abstract Spaces. (Topology) Three hours credit. Throughout the year. An introduction to the modern theories of general spaces. Transfinite numbers; infinite operations on sets; rings and fields; topological spaces; metric spaces; linear spaces; functions; and related topics. Price.

The departmental records show that this new course was taught during 1938-1939, with an enrollment of three students during the first semester and two students during the second. Professor Jordan's departmental record lists the course as Mathematics 312, Topology. "Topology" may be simply an abbreviation for the long title, but the number "Mathematics 312" is unexplained (perhaps "312" was a misprint). Mathematics 302 was important because it was the first of the Department's modern courses. Mathematics 302 continued to be listed in the catalog, but its description was changed in the 1946-1947 catalog:

> Mathematics 312a and 312b. Introduction to the Theory of Abstract Spaces. (Topology) Each three hours credit. 302b is a continuation of 302a. Price.

Further evolution and development changed these two courses into Mathematics 312a, Introduction to Topology, and Mathematics 312b, Algebraic Topology; these courses and titles appear in the catalog for 1970-1971.

I also introduced modern abstract algebra into the Department: Mathematics 304, Introduction to Modern Abstract Algebra, with an enrollment of three students, was taught during each of the two semesters of 1940-1941. This course was listed in the 1940-1941 catalog for the first time:

> Mathematics 304. Introduction to Modern Algebra. Three hours. Throughout the year. An introduction to modern abstract algebra. A study of groups, rings, fields, matrices, matrix algebras, linear associative algebras, lattices, and recent developments in the field of algebra. Price.

I was stimulated and emboldened to introduce this course as a result of spending the summer of 1938 at the University of Chicago, and by the appearance of books on algebra by A. A. Albert and others, especially C. C. MacDuffee's *An Introduction* *to Abstract Algebra*, in 1940. The records show that MacDuffee's book was used as a textbook in Mathematics 304, at least during the second semester of 1940-1941. Birkhoff and MacLane's *A Survey of Modern Algebra*--the book which really established abstract algebra widely as a graduate course--was published in 1941. Mathematics 304 continued, but it also underwent change and evolution. In the catalog for 1957-1958 it appears as Mathematics 304a and 304b, Topics in Modern Algebra, with Professor W. R. Scott as the instructor. The next year this course was listed as Mathematics 304a and 304b, Rings; these two courses (with modernized topics) appear in the catalog for 1970-1971.

On the whole, graduate students from The University of Kansas who sought Ph.D. degrees in mathematics at other universities were not as successful from 1925 to 1945 as they had been earlier. It seems that Princeton University received an unsatisfactory graduate student from the Department in the 1930's: the Department was not able to send a graduate student to Princeton between 1937 and 1969. In 1969 Princeton accepted William D. Homer II, who had just received a B.A. degree with a straight A record (the eighth in history!) from The University of Kansas and had been awarded a National Science Foundation Predoctoral Fellowship. Some graduate students, however, did succeed between 1925 and 1945. E. W. Titt was an assistant instructor in the Department in the year 1928-1929; he obtained a Ph.D. degree from Princeton University in 1932. Professor Titt has held a number of important positions and is now Professor of Numerical Analysis at the University of Arizona [see *American Men of Science*]. Paul Eberhart received an M.A. degree from K. U. in 1929 and was an assistant instructor in 1929-1930; he received a Ph.D. degree from Brown University in 1943. For many years he was Chairman of the Department of Mathematics of Washburn University in Topeka [see *American Men of Science*]. Alfred Lee Baldwin, a graduate student in psychology, was an assistant instructor in the Department during 1936-1938; he received a Ph.D. degree in psychology from Harvard University in 1941 and became a distinguished psychologist at Cornell University [see *American Men of Science*]. The most distinguished of the Department's graduates between 1925 and 1945, however, was Charles Earl Rickart, who received a B.A. degree in 1937 and an M.A. in 1938. He wrote a master's thesis under Professor Mitchell's supervision. He was a student in Mathematics 301 during 1937-1938, the course in which I taught topology and abstract spaces for the first time; he has stated that this course was helpful when he continued his graduate work at the University of Michigan. He wrote his Ph.D. thesis under the supervision of Professor E. H. Hildebrandt on a problem which was essentially a generalization of a paper on integration published by me in the *Transactions of the American Mathematical Society* in 1940. Richart received his Ph.D. from Michigan in 1941, held a Benjamin Peirce instructorship at Harvard during 1941-1943, and has been a member of the faculty of Yale University ever since. Rickart was Chairman of the Department of Mathematics at Yale from 1959 to 1965 [see *American Men of Science*]. Marlow Sholander was an assistant instructor in the Department from 1938 to 1940; he received an M.A. degree from Kansas in 1940 and a Ph.D. degree in mathematics from Brown University in 1949. Professor Sholander's most recent position has been at Case Western Reserve University in Cleveland [see *American Men of Science*]. James Bruce Crabtree received a master's degree from The University of Kansas in 1942 and a Ph.D. degree from Harvard University in 1950 [*Bulletin of the American Mathematical Society*, vol. 57 (1951), p. 212]; he is now an associate professor at Stevens Institute of Technology [see the 1975-1976 Combined Membership List of AMS, MAA, and SIAM]. I supervised the master's theses of Sholander and Crabtree.

Martha Elizabeth Peterson received an M.A. degree in mathematics in 1943 and a Ph.D. degree in education in 1959, both from The University of Kansas.

She has been instructor in mathematics, assistant dean of women, and dean of women at The University of Kansas, dean of women and assistant to the president at the University of Wisconsin, and President of Barnard College at Columbia University. In 1975 she became President of Beloit College in Wisconsin. Her complete biography can be found in *Who's Who in America*.

The following is a sample of the titles of master's theses written in the Department during this period.

Black, Florence Lucile — M.A. 1921
"Methods of Generating Plane Cubic Curves"

Babcock, Wealthea Consuelo — M.A. 1922
"On Co-Axial Minors of Determinants"

Eberhart, Paul — M.A. 1929
"$\bar{\Gamma}(x)$ and Related Functions"

Rickart, Charles Earl — M.A. 1938
"The Pascal Configuration in a Modular Plane"

Sholander, Marlow Canon — M.A. 1940
"Some Properties of a Space Whose Points Are Matrices of Point Sets"

Crabtree, James Bruce — M.A. 1942
"A Generalization of the Riemann Integral"

Peterson, Martha Elizabeth — M.A. 1943
"Some Properties of a Special Four-Point"

The following table shows the number of master's degrees awarded by the Department from 1920 through 1950.

| Year | Number | Year | Number | Year | Number |
|---|---|---|---|---|---|
| 1920 | 2 | | | | |
| 1921 | 2 | 1931 | 6 | 1941 | 1 |
| 1922 | 7 | 1932 | 4 | 1942 | 3 |
| 1923 | 6 | 1933 | 8 | 1943 | 1 |
| 1924 | 3 | 1934 | 4 | 1944 | 0 |
| 1925 | 2 | 1935 | 6 | 1945 | 0 |
| 1926 | 6 | 1936 | 5 | 1946 | 0 |
| 1927 | 3 | 1937 | 3 | 1947 | 1 |
| 1928 | 7 | 1938 | 3 | 1948 | 7 |
| 1929 | 6 | 1939 | 2 | 1949 | 10 |
| 1930 | 2 | 1940 | 3 | 1950 | 3 |

By 1940 World War II dominated all activities in mathematics as well as in other areas of life. As the war approached, the leaders in mathematics in this country began to make preparations for our possible involvement. One step was to strengthen mathematics in the United States by accepting all of the able mathematicians from Europe who wanted to come to this country [Dresden 1]. Positions for mathematicians were scarce, and the nation had great difficulty in absorbing the large numbers of mathematicians who came from abroad. When Hitler removed Otto Neugebauer as editor of *Zentralblatt für Mathematik*, the mathematicians in the United States knew that they must establish their own review journal. *Mathematical Reviews* began publication in January 1940. At the request of Dean Richardson, I spent the summer of 1940 at Brown University assisting in the task of building up the circulation of *Mathematical Reviews* [Price 32]. I taught in the Harvard Summer School in 1941; there I saw Birkhoff and MacLane's *Algebra* in galley proof. In 1943, the Air Force requested that I accept an assignment overseas in operations research; I did so, and an account of my experiences is given in Appendix VIII of the Supplemental Volume. All normal activities in mathematics ceased until after the war was over.

The period from 1925 to 1945 was one in which the development of mathematics lagged badly at The University of Kansas. Modern mathematics, beginning in 1902, developed rapidly with the introduction of the following subjects: Lebesgue measure and integration, Fredholm's theory of integral equations, Hilbert space, Hausdorff space, Banach space, analysis situs, point set topology, algebraic topology, functional analysis, and abstract algebra (groups, rings, and fields). None of these subjects, however, was taught in the Department before my arrival in 1937, and there was no significant instruction in abstract algebra before 1940. Professor Lefschetz was certainly one of the creators of topology, but his research in this field did not result in courses of instruction in it. Professor G. W. Smith received his Ph.D. degree from the University of Illinois in 1917 for a thesis on linear algebra (not to be interpreted as linear space theory); his thesis was supervised by Professor James Byrnie Shaw. Professor Smith, however, never engaged in research, and he did not participate in nor follow the development of modern algebra. The members of the staff received their graduate education either in a very early period or in universities that did not provide opportunities to study the newer subjects. In any case, the staff of the Department was heavily loaded with teaching and administrative responsibilities that provided little opportunity or encouragement for scholarship or research. The lag in the Department's mathematical development was all the more conspicuous because of the rapid progress in European mathematical centers and in a small number of leading American universities. Around 1925 or 1930 American mathematics began to move forward rapidly as a result of renewed efforts by the Americans themselves. Beginning around 1930 these efforts were strengthened and accelerated by the migration of leading European mathematicians to the United States [Dresden 1]. Finally, after 1937 or 1938, the progress of American mathematics received further stimulation and support from the impending and actual World War II.

The list of members of the staff of the Department of Mathematics for the period 1925-1945 [S, ch. 4, sec. 4] emphasizes the large number of temporary instructors and assistant instructors employed during this period and also the emergency measures used by the Department to supply staff for its war programs during World War II. Professors Bell and Price had already received Ph.D. degrees before they were appointed in 1936 and 1937 respectively, and they became permanent members of the Department's staff. Robert S. Pate received a Ph.D. degree from the University of Illinois in 1941, but he was not appointed for a second year. Gerhard K. Kalisch received a Ph.D. degree from the University of Chicago in 1942, and he remained for two years. Martha Peterson had been one of the Department's graduate students; she received a master's degree in 1943 and became a permanent instructor. All of the others in the staff list (see [S, ch. 4, sec. 4]), beginning with Minnie Robertson in 1942, were emergency war instructors. The Department taught special mathematics programs for men in uniform in both the Army and Navy; two of these were known as the ASTP program (Army Specialized Training Program) and the Navy V-12 program. Professor Price was teaching a class of fifty Army men in the ASTP program when he left to go to England for the Air Force in 1943, and he taught a V-12 class after he returned from England in 1945. Mrs. Jensen, widow of an economics professor, was a temporary war instructor. Professor N. W. Storer was a member of the staff of the Department of Astronomy. Mr. Brenneman was an instructor in electrical engineering. Marvin E. Rolfs was a graduate student in mathematics. Lucy

Dougherty was a retired high school teacher of mathematics. Professor Anna Marm, a member of the faculty of Bethany College in Lindsborg, Kansas, had been a graduate student and instructor in the Department from 1918 to 1921. Professor Joseph F. Wilkins was head of the University's Department of Voice; he was a graduate in engineering from Cornell University. Professor W. D. Paden was a member of the staff of the Department of English; many years earlier he had completed all requirements except the thesis for a Ph.D. degree in mathmatics at Yale University. Professor C. M. Crosier was a member of the University's Department of Civil Engineering. Professor E. B. Dade was Professor of Business Administration, Richard S. Howey was Professor of Economics, and Arthur J. Mix was Chairman of the Department of Botany. Genevieve Fisher and George Hiatt were instructors in Education. Frank Jirik, Robert R. Russell, and Henry F. Holtzclaw, Jr., were assistant instructors in Chemistry. Henry F. Holtzclaw, Jr., received his A.B. degree from The University of Kansas in 1942 and his Ph.D. degree in chemistry from the University of Illinois in 1947; since 1947 he has been a member of the faculty of the University of Nebraska. It is not possible to identify some of those whose names appear in the list, nor is it possible to be absolutely certain that the list is complete. The list given includes all names that could be found in the Department's records and in the University catalogs, but no catalogs were published for the years 1942-1943, 1943-1944, and 1945-1946 because of difficulties created by World War II.

## Chapter 5

## The Golden Age of Mathematics

## 1945-1970

The account in this chapter will be a brief one, because the full details of the crowded years from 1945 to 1970 would fill a large volume. I feel that I should not undertake an evaluation of the Department during this period both because I was personally involved and also because the perspective of history is needed for an objective evaluation. Many events, however, already stand out in sharp outline, and many of the motivations and forces which controlled them are clearly visible. This chapter will present an account of what happened in the Department of Mathematics during one of the most momentous periods in the history of the world.

I returned to Lawrence and to The University of Kansas at the beginning of September, 1945, and began teaching again. Evidences of the war were still visible: I was given a class of men in uniform in the Navy's V-12 program. On the whole, however, the year 1945-1946 was a period of calm after the great war and before the flood of returning veterans reached the campus. Everyone thought in terms of returning to normal--meaning to the past--, not realizing that the future would bring a completely new world. The war had been a serious interruption of almost five years, but, fortunately for me, I had been working on some very interesting problems at the time when the war forced me to lay all mathematics aside. The war over, I was anxious to resume work on these problems. I decided to apply for a Guggenheim Fellowship. I was encouraged in this plan by the fact that priority was given to those who had been engaged in the war, and also by the fact that John M. Harlan (who had been Chief of the Operational Research Section at Headquarters, Eighth Air Force, in England and who wrote a letter for me) was a good friend of Henry Allen Moe, Secretary of the John Simon Guggenheim Memorial Foundation. I was delighted when I was awarded a Guggenheim Fellowship for 1946-1947. Unfortunately, all universities were crowded with returning veterans by the fall of 1946, and the housing situation forced me to remain in Lawrence during the tenure of my fellowship. Although there were many interruptions and distractions because I was working at home, I nevertheless made progress on my research program: a new treatment of partial derivatives and Jacobians that I had undertaken before the interruptions of World War II. I rediscovered many identities in the theory of determinants that were suggested by the new theory of partial derivatives and Jacobians; these identities were included in a paper which I gave on the program of the Mathematical Association of America at its meeting at Cornell University on August 19-20, 1946 and which I later published in the *American Mathematical Monthly* [Price 4]. I was not able to complete the project on partial derivatives and Jacobians during the fellowship, however, and I was not able to resume serious work on it again until after my term as chairman of the Department ended in 1970.

There were a number of important developments in the year 1946. First of all, the Department had a new chairman. Dean Stouffer had been chairman of the Department since January 1941, when Professor Mitchell resigned because of ill health. In September 1946, Dean Stouffer gave up his positions as Dean of the Graduate School and Chairman of the Department of Mathematics; he was appointed Dean of the University by Chancellor Malott. Dean John H. Nelson was appointed Dean of the Graduate School; he had been the Associate Dean. Professor Guy W. Smith was appointed Chairman of the Department of Mathematics. Dean Stouffer informed me of these appointments after they had been made; I am not aware that any member of the Department was consulted about the choice of the new chairman. Professor Smith continued as chairman until June 30, 1951, when he retired because he had reached the mandatory retirement age.

The period of Professor Smith's chairmanship coincided with the years when the University was crowded with returning veterans. The teaching load of the Department of Mathematics had been heavy even during the years of World War II, but the number of student-hours of instruction per week jumped from about 3,000 in 1945-1946 to well over 10,000 in 1946-1947 [Taft 2, pp. 174, 210]. In a short time the enrollment of the University doubled--the peak of the post war enrollment fell just short of 10,000 students. The University was forced to resort to many temporary and emergency measures to provide facilities and instructors for the flood of veterans who came to the University with the support of the G.I. Bill. The University moved to the campus a number of temporary wooden buildings which had served war purposes in other locations and were no longer needed. These war buildings included a number of temporary annexes to Strong Hall (located behind Strong Hall where Spencer Memorial Library now stands) and Oread Hall (reassembled as a dormitory just west of the stadium). As always happens, temporary buildings quickly became permanent. The staff of the Department increased, and as the years passed many assistant instructors and even full professors were given offices in Strong Annexes B, C, D, and E. These offices in the temporary annexes to Strong Hall continued to be an important part of the Department's space up until about 1965 when they were torn down to make room for Spencer Memorial Library. At that time all of the Department's assistant instructors were moved into Oread Hall, described as "temporary" when it was erected in the fall of 1946 [*The Graduate Magazine* 97], but which provided office space for them until the fall of 1975.

Professor Smith was kept busy finding instructors, planning schedules, and supervising instruction in a rapidly expanding Department. Nevertheless, he seemed to handle the assignment with ease. Although busy with teaching and other university duties, Professor Smith was closely associated with the K. U. athletic program over a period of many years. He attended nearly all of the home football games, and he played golf frequently and exceptionally well. Shortly before his death, the *Lawrence Daily Journal-World* published an account, written by Bill Mayer, of Professor Smith's interest in sports [Smith 1].

> Ageless Dr. Guy Smith of Lawrence begins his 65th year as a football fan this fall. In the period since he got on the gridiron bandwagon in 1904 the 82-year-old former Kansas University mathematics professor has missed only two games played by "my teams."
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> The only gaps on Smith's remarkable slate of attendance are Kansas' 27-7 victory over Nebraska here in 1948 and KU's 13-all tie with Oklahoma in 1960, the year KU won the league championship but then had to forfeit two games and the title because of the Bert Coan case.
>
> "Just couldn't get to those two games due to previous commitments," Smith says, "but they're the only two in 64 years. I've already got my season tickets bought for 1968, the 65th year. And things look pretty promising for the Jayhawks. This Pepper Rodgers has instilled a lot of excitement and enthusiasm."
>
> The spry and alert Dr. Smith never saw a football game until he was a freshman at Colorado University in 1904, when his amazing string began. Since then, he's been at Illinois, Beloit College, Kentucky University and finally Kansas. He came to KU in 1920, taught math for 36 years and then retired in 1956 at age 70. Smith was a well-known member of the KU Athletic Board from 1939 until 1956 when he retired.
>
> A native of Colorado, Dr. Smith got his bachelor's degree in engineering at the Boulder university in 1908. He taught and worked on his master's degree at CU. Graduate work began at Illinois in 1913 and it culminated with a Ph. D. in 1917. It was Beloit, Wis., College for 1917-1918, then Kentucky from 1918-20. He moved to Kansas in 1920 where he became one of KU's best-known faculty members and sports figures due to his interest and his athletic board affiliation. And whenever KU plays football at home, Smith is a virtual landmark due to his faithful attendance.
>
> "I've seen some good times and some bad here," the former prof says. "These crowds of 45,000 and up now are exciting, but it hasn't

always been this way. I can remember back in the old days when KU was lucky to have 5,000 people in that stadium. The rise in interest has been tremendous.

"You find it hard to believe how the game has changed from that first one I saw back in 1904 at Colorado. Then you had three downs to make five yards to keep the ball, there wasn't anything like a huddle and headgear was non-existent.

"The result was that you had a lot of bushy-haired players in those days, with good reason--protection. I don't know what the real excuse is for that sort of thing by the youngsters nowadays."

While at Illinois in 1913, Smith saw the remarkable coach Bob Zuppke develop the huddle in 1913.

"Up to then, they just gathered up at the line and decided on a play from there," Smith recalls. "Then Zuppke set up the huddle where the quarterback or captain called a play and set the strategy, and it's been the same ever since.

"Perhaps the biggest changes in the game--aside from the size of men and precision and all--have come about through the early training of young people. In the early days, high school ball wasn't much, and junior high ball was unheard of. The boys today begin playing on an organized basis much sooner and they're much more polished by the time they are of college age. The equipment is better--it's like the difference between day and night. But the thrills--they're all the same."

Smith picks former KU football-basketball All-American Ray Evans as the player who over the 64-year span has impressed him most as both an athlete and citizen. "We've had many great ones, and I've known most of them, but Ray just had that something special. If he couldn't do it all himself, he had the ability to inspire others to rise to an occasion. He was a truly remarkable individual, in school and out. He's my first choice for any all-time, All-American team they pick."

Mathematician that he is, Dr. Smith has kept an elaborate set of statistics on the teams he has followed. Colorado had a .795 record in the nine years Smith was a Buffalo-backer, Illinois was .667 in Guy's four years there, Beloit was .667 in one year, Kentucky .400 in two years and Kansas is near .600 at home since Smith took over bird-watching (Jayhawks that is) in 1920.

Along with his statistical and administrative affiliations through the years, Smith has had a great deal of close personal touch with the KU athletic program. He often served as a tutor to athletes and he has a high regard for young men sometimes considered "big and dumb." "They're like any other students--good and bad--and there's no special magic about them except they can play sports. I can dissolve all sorts of myths, but why try? The records of the young men in later life, like Ray Evans, attest to their caliber."

Guy met his wife, Linda, when she was a home economics teacher in Kentucky, and they were married in 1921. They live at 1730 Ill. and their daughter, Lucy, is the camp administrator for the Girl Scout program in metropolitan Denver.

"We've lived on the south side of the Hill for 40 years and we're looking forward to the next 40," Smith says with a smile. "And as long as we're there, you can expect me at the KU home games."

Professor Smith was not granted his sixty-fifth football season nor the next forty years to which he had looked forward. He died unexpectedly on September 9, 1968--less than three months after Mayer's article appeared [Smith 2]. Professor Smith had lived a full life, and he won a secure place for himself in the esteem of the community. The opening paragraph of an editorial published in the *Lawrence Daily Journal-World* two days after his death reads [Smith 3]: "The Lawrence-KU community Monday night lost one of its all-time top citizens when energetic Guy Smith, professor emeritus of mathematics, died at the age of 82 following a brief illness."

Mathematicians were scarce after World War II. The nation had produced very few during the depression years of the 1930's, and almost none during World War II. Graduate students were not granted deferments to continue their studies but all were drafted in an effort to achieve democratic equality. As a result, nearly all of those employed at The University of Kansas to teach mathematics to the returning veterans were temporary instructors. There was one exception. In the fall of 1946 Robert Schatten joined the staff as an associate professor. (See his biography in the Eleventh Edition, 1967, of *American Men of Science* [S, Appendix IX, Schatten].) Professor Schatten, a native of Poland, came to the United States about 1936. He received a master's degree from Columbia University in 1939 and a Ph.D. degree in 1942. His Ph.D. thesis was written under the supervision of Professor Francis J. Murray. Professor Schatten entered the United States Army in 1942, but soon thereafter he suffered a broken back in a training exercise. After a long and painful recovery, Schatten was discharged from the Army in 1943; he taught at the University of Vermont during 1943-1944. Professor Murray had collaborated with Professor John von Neumann on the first two of a series of three important papers on rings of operators on a Hilbert space, published in the *Annals of Mathematics* and in the *Transactions of the American Mathematical Society* between 1936 and 1940. Professor Schatten, with the help of Professor Murray, applied for and received a National Research Council Fellowship (one of the very few postdoctoral fellowships in mathematics in existence at that time); Professor Schatten worked with Professor von Neumann at the Institute for Advanced Study during the two year period 1944-1946. He came to Lawrence after his two years in Princeton.

Professor Schatten added strength to the staff at a time when it was very weak. A specialist in the field of functional analysis, Professor Schatten assumed the leadership for the Department's work on topology and Hilbert spaces. Much of his research was on cross spaces, and his publications were highly regarded. Professor Schatten developed a real fondness for Lawrence and an attachment to The University of Kansas, but eventually he sought the big city: he resigned in 1961, and he has been a member of the faculty of Hunter College in New York City since 1962.

Another event which occurred in 1946 played a role in shaping the future: I was requested to accept a position as Associate Secretary of the American Mathematical Society with responsibility for overseeing the Society's institutional members. My involvement in the activities of the mathematicians had begun early. I was appointed a member of the Committee on Publicity of the

American Mathematical Society in the latter part of the 1930's. At the 1938 spring meeting of the Kansas Section of the MAA, I gave a paper entitled "A Program for the Association"; it was published in the *Monthly* [Price 1], and it led first to a reorganization of the Association [Price 2], and later to other developments [Price 20]. At the request of Dean Richardson [Archibald 1, pp. 103-105], I had served as an unofficial circulation manager for *Mathematical Reviews* when it was established in 1940 [Price 32]; and in December 1940, I had been elected to a three-year term on the Council of the American Mathematical Society. In 1943 I had been elected an Associate Secretary of the Society, but, unable to serve because of my absence in England, I had been replaced in 1944. Now in 1946, the Society requested that I accept this even more important assignment. Dean Stouffer advised me not to accept the Associate Secretaryship offered by the Society.

Nevertheless, I decided, perhaps unconsciously, on a course of action which would promote the development of a strong Department of Mathematics at The University of Kansas. Other choices would have been possible. First, I could have moved to a distinguished university with a strong Department of Mathematics--and I had more than one opportunity to do so. But I had moved and traveled a great deal between 1925 and 1945 (Mississippi, Harvard, Mississippi again, Harvard again, Union College in Schenectady, Rochester, Brown, Kansas, the war in England, and Kansas again--not to mention a great deal of additional moving and traveling during the summers!). I was reluctant to move again, because I had a strong feeling that if I was ever to accomplish anything, I must stop moving and stay in one place. In spite of difficulties and drawbacks, there were advantages to be gained by staying in Lawrence. A second choice was to remain at The University of Kansas but to concentrate on writing as many research papers as possible and to ignore everything else. The third choice was to undertake the development of a strong Department of Mathematics at The University of Kansas. I leaned toward the third choice, because it seemed to me that a Department was more important than the accomplishments of one man.

To build a Department would require money, a staff of mathematicians, and students. The University of Kansas had never supported its Department of Mathematics with adequate funds, and there was no reason to believe that it would do so in the future. If funds to build a Department were to be obtained, they must be found outside Kansas. Furthermore, mathematicians for the staff must be sought outside Kansas. Finally, graduate students also must be obtained from other states. The University had good undergraduate students, but the best ones were sent elsewhere for graduate work. Other Kansas colleges and universities likewise sent their best graduates to other states for graduate work. If funds were available, however, there was at least a possibility that staff and students could be attracted from elsewhere.

The attitude of the nation toward science and mathematics was highly favorable in 1946, and there seemed to be a strong probability that funds for the development of a Department of Mathematics would be available from the federal government. This favorable attitude toward science and mathematics, especially on the part of the federal government, resulted directly from the highly important--and even crucial--contributions that science and mathematics made to the winning of World War II. Appendix VIII of the Supplemental Volume, which describes my own experiences in operations research with the Eighth Air Force, has been included in an effort to give one concrete illustration of the contributions the mathematicians made to the war effort. President Roosevelt recognized the importance of the contributions of science, mathematics, and technology in the war, and he sought to maximize their contributions to the welfare of the nation in peace time. At Roosevelt's request, Vannevar Bush prepared his report entitled *Science: The Endless Frontier* [Bush 1]. This report, submitted in July 1945, carried the sub-title *A Report to the President on a Program for Postwar Scientific Research*; it had enormous influence on the policies of the federal government toward science and mathematics in the period from 1945 to 1970. The Office of Naval Research (ONR) was established in 1946, and Dr. Mina Rees, whom I had met while engaged in operations research studies for the Air Force, was in charge of mathematics in ONR. The Office of Naval Research played an important role in supplying funds for the support of research in science and mathematics, especially during the years before the establishment of the National Science Foundation. Vannevar Bush's *Science: The Endless Frontier* resulted in immediate efforts to establish the National Science Foundation. The first bills passed by Congress were unsatisfactory to President Truman, but the National Science Foundation finally became a reality in 1950. In the period immediately following World War II, science and mathematics were considered highly beneficial, and those who promoted research and the training of scientists and mathematicians were considered to make patriotic contributions to the nation's national security and economic welfare. Scientists and mathematicians should remember, however, that their subjects were supported because of their utility and their contributions to the welfare of the nation--not because the nation felt an obligation to support pure science for its own sake.

Thus, in 1946, when the American Mathematical Society asked me to become an Associate Secretary, there were hopes that funds might become available from the federal government to help build a Department of Mathematics at The University of Kansas. But clearly there would be competition for funds, staff members, and students. The Department must find some way to attract favorable attention to itself, and to overcome the unfavorable reputation of the state and of the

University. Under these circumstances I felt that the invitation from the American Mathematical Society to become an Associte Secretary offered an opportunity to promote the development of the Department, and I accepted. I was placed in charge of the Society's institutional members and given certain other duties. This position led to correspondence with the chairmen of the nation's leading departments of mathematics. I was able to increase the number of the Society's institutional members and also the Society's income from the dues they paid. I continued as Associate Secretary until the end of 1949, at which time the Society moved its headquarters from Columbia University to Providence, Rhode Island and placed H. M. MacNeille in charge as Executive Director.

I sought in every way possible to promote the development of the Department. Professor Smith was chairman, but as Associate Secretary of the AMS I bore much of the responsibility for maintaining contacts with other universities and mathematicians. In spite of the scarcity of mathematicians and of funds, some new staff members were added. As stated, Robert Schatten came in 1946. I. N. Herstein and Gordon Overholtzer were appointed to instructorships in 1948; both had received their Ph.D. degrees from Indiana University in 1948. Overholtzer left the Department in 1949; apparently he did not achieve a career as a mathematician. Herstein left the Department in 1950; presently a member of the faculty of the University of Chicago, he has become one of the nation's leaders in the field of algebra. Vidar M. Wolontis, a native of Finland who received his Ph.D. degree under Professor Lars V. Ahlfors at Harvard University, was appointed to an assistant professorship in 1949; he left in 1953 to join the staff of the Bell Telephone Laboratories. Sarvadaman Chowla, a number-theory specialist from India, served as a visiting professor from 1949 to 1952. But the most important appointment by far in this period was that of

William R. Scott, who became an assistant professor in 1949 and remained on the staff until he went to the University of Utah in 1965. Professor Scott was trained as an analyst at Ohio State University under Professor Tibor Radó, but he changed his field of research to algebra and especially the theory of groups. He was the Department's leader in the field of algebra as long as he was a member of the staff. (See his biography in the Eleventh Edition, 1967, of *American Men of Science* [S, Appendix IX, Scott].)

The postwar years were characterized by enrollments swollen with returning veterans and by the scarcity of funds and staff members, but some progress was made. I sought some of the research funds that had become available at the national level. I sought and received a grant of $5,000 from the Research Corporation, but the grant was not renewed. It seems that the Research Corporation expected its funds to be used for the support of research only and not in any way for the training of graduate students. An inquiry about a contract from the Office of Naval Research led to a visit to The University of Kansas by Mina Rees and eventually to a small contract. The work on this contract, under my supervision, was only partly successful and the contract was terminated about the time Professor Aronszajn arrived in 1951.

The number of Ph.D. degrees awarded also indicates that progress in developing the Department was slow from 1945 to 1951. Edison Greer received a Ph.D. degree in 1947 for a thesis supervised by Professor P. O. Bell, and Warren Keith Moore received a Ph.D. degree in 1951 for a thesis which I supervised. The steady production of Ph.D. degrees began the next year, however, with three degrees in 1952, two in 1953, one in 1954, and three in 1955.

I was elected an editor of the *Bulletin of the American Mathematical Society* at the beginning of 1950 (my term as Associate Secretary of the Society ended in 1949), and reelections subsequently extended my term through 1957. In 1950 the other editor of the *Bulletin* was E. B. Stouffer; thus, in that year both editors of the *Bulletin* were members of the K. U. Department of Mathematics. I was assigned responsibility for the publication of invited addresses and for articles on the life and work of distinguished mathematicians. I always wrote to those who gave invited addresses at meetings of the Society to remind them to submit their papers for publication. Many did so, but not all. For example, I invited Professor von Neumann to submit the manuscript of an address on automata theory which he gave at the Christmas meeting in St. Louis in 1952. Professor von Neumann replied that he was writing a book on automata theory and that, although he encountered little difficulty in compressing the book into an hour's lecture, he found it impossible to write the lecture down; the manuscript of the lecture was never received. Invited articles on the life and work of distinguished mathematicians were always full of trouble. Some articles, although repeatedly promised, were never written. For example, the editors were embarrassed because the article about Professor J. R. Kline that was promised was never forthcoming. Professor Kline was Secretary of the American Mathematical Society following the long term of Dean R. G. D. Richardson; Kline's term extended through the International Congress of Mathematicians held at Harvard University in 1950. In some cases articles were not wholly appropriate, but they had to be published as submitted because they had been written in response to a request. When Professor von Neumann died in 1957, the editors (John C. Oxtoby, B. J. Pettis, and myself) arranged a special meeting with Professor S. Ulam to plan a series of articles on his life and work. Although my term as editor ended in 1957, my responsibility for the articles on von Neumann continued until they were published as a supplement to a number of the *Bulletin* in 1958.

Dean Stouffer retired as Dean of the University on June 30, 1950 [Stouffer 6, 7]. Because of his long and distinguished career in the University, I suggested to Chancellor Malott that we arrange to have Dean Stouffer's portrait painted. Chancellor Malott had already made similar plans, and I was invited to combine my efforts with those of the University. I called in person on many of the older members of the faculty and asked for donations for a portrait. These funds, together with those provided by the administration, were sufficient to pay for a portrait. John Maxon had been appointed Director of the Art Museum in 1948; young and vigorous, he completely reorganized the museum and turned it into the modern art gallery it is today [*The Graduate Magazine* 98].

Chancellor Malott made Maxon and myself a committee of two to arrange for Dean Stouffer's portrait. The most famous artist in the area was Thomas Hart Benton in Kansas City. When we inquired about the possibility of getting him to paint Dean Stouffer's portrait, we were told that he would charge $3,000 (much more than we had!), that we would not like the portrait if he painted it, and that we probably could not persuade him to paint it in any case. We arranged for the portrait to be painted by Bernice Ackermann Lopez, a resident of Lawrence and a former student in the University. The portrait was painted in Dean Stouffer's office, room 225, Strong Hall; by special arrangement of John Maxon and myself it was a large portrait that showed Dean Stouffer seated in his special leather chair (bought for $75 by special authorization of the Governor for Dean Stouffer's ailing back many years before). By special request the portrait showed a volume of the *Bulletin of the American Mathematical Society* lying on the table in front of Dean Stouffer; it was intended as a reminder of the fact that he was one of the journal's editors at the time. I arranged an elaborate reception honoring Dean and Mrs. Stouffer as the occasion for the first public showing of the portrait; the reception was held in the Art Museum on Sunday afternoon, February 25, 1951. A piano and strings provided music for the occasion; Dean and Mrs. Stouffer and their daughter Jean stood in the receiving line beside the portrait on an easel. Although it was February, the reception was preceded by a shower of rain; in spite of the weather, however, several hundred members of the faculty and their wives and friends of the Stouffers came to the reception. The portrait and reception were fitting tributes to one who had contributed so much to the University. Although I considered that the portrait belonged as much to the Department of Mathematics as to the rest of the University, it was hung in the office of the Graduate School; after all, in 1951 the Department did not have a suitable room in which to display it.

During the painting of Dean Stouffer's portrait, Chancellor Malott's attention was attracted to the portraits of the former chancellors. Now in Spencer Memorial Library, they hung at that time around the second floor of the rotunda in Strong Hall. Chancellor Malott observed that the portrait of Chancellor Snow was larger than the others, and he proposed to John Maxon that it be cut down to match the others in size. Maxon protested that Snow's portrait was the finest one in the collection and insisted that Malott must not ruin it. "Chancellor Malott," he said, "you have the authority to cut Chancellor Snow's portrait down in size, but you have no moral right to alter a work of art in that manner!" Chancellor Malott heeded Maxon's protests and left Chancellor Snow's portrait untouched. But Maxon's protests did not restrain someone from cutting Dean Stouffer's portrait down in size as I discovered on a visit to the office of the Graduate School about 1965. The portrait now shows little more than his head and shoulders. The chair and the volume of the *Bulletin of the American Mathematical Society*, included in the original portrait by special request of the Department of Mathematics, have been removed. There is a record of what was lost from Dean Stouffer's portrait: almost all of the original portrait is shown in a photograph taken at the reception in the Art Museum on February 25, 1951, and published in the *Kansas Alumni Magazine* [Stouffer 5]. Also, a photograph of the original portrait was given to Mrs. Stouffer.

The year 1951 was an eventful one for the University and also for the Department of Mathematics. First, Chancellor Malott resigned to become President of Cornell University; Roy Roberts reviewed his accomplishments at The University of Kansas for the alumni [*The Graduate Magazine* 99]. Dean Stouffer was made chairman of a faculty advisory committee to assist the Board of Regents in its search for a new chancellor [Stouffer 10]. Franklin D. Murphy, at that time Dean of the Medical School, was elected chancellor, but he did not assume the position until September 1951. Dean John H. Nelson was acting chancellor from the time of Malott's departure in June until Murphy's arrival in September. Also, 1951 was the year of the great flood. May and June had been rainy months, but finally in July a front settled down along the Kansas River, and it poured rain every day for about a week. On the final night I joined a crew that was filling sand bags to bolster the levee on the Jackman turkey farm, east of Lawrence on the north side of the river. My conception of futility is still supplied by my vivid recollection of a man who threw a shovel full of dirt at the top of the levee that night--the water quickly went five feet over the top of the levee, and five thousand turkeys on that one farm alone went down the river. Friday, July 13, 1951, was the day when the levees broke in Kansas City. The great flood moved down the Missouri River and brought the Mississippi River at St. Louis to its all-time high mark. The damage in North Lawrence was very great, but there was almost no damage in Lawrence on the south side of the river.

For a time Lawrence and Topeka were isolated from the outside world even by highway, and no trains arrived in Lawrence for about a month. There had been devastating floods on the Kansas River in 1844 and 1903, but the great flood of 1951 was the worst of all [Taft 2, pp. 1, 77-78 and 177].

But the most important event for the Department of Mathematics in 1951 was the arrival of Professor Nachman Aronszajn. Negotiations opened abruptly and without previous announcement on the Saturday before commencement, with a telephone call from Professors Aronszajn and Diamond at Oklahoma State University in Stillwater. Professor Ainsley H. Diamond was Chairman of the Department of Mathematics there, and Aronszajn had been Research Professor of Mathematics with a contract from the Office of Naval Research since 1949. Troubles had arisen at Oklahoma State University as a result of a loyalty oath imposed on the faculty by the state legislature. Professors Aronszajn and Diamond had asked Mina Rees in ONR whether she could suggest a university where they could move with their ONR contract. Mina Rees replied, "Why don't you try Baley Price at The University of Kansas?" This suggestion led to the telephone call I received two days before commencement in 1951. It was quickly arranged that Professors Aronszajn and Diamond would come to Lawrence on Monday, Commencement Day, to explore the possibilities of moving to The University of Kansas.

The timing of the inquiry from Professors Aronszajn and Diamond was fortunate for The University of Kansas. Chancellor Malott had succeeded in obtaining a research fund of $300,000 from the legislature in the spring of 1951 [Malott 1]. We now know that Chancellor Malott requested this fund after he learned that President McCain of Kansas State University had sent a request to the legislature for a similar research fund. The legislature made the appropriation for the $300,000 research fund about April 1--so late that it was difficult for the University to develop good plans for its use during the next fiscal year. Thus, the proposed move of Professor Aronszajn's research project to Lawrence offered a real opportunity to The University of Kansas. Mina Rees had promised that Aronszajn could bring his ONR contract with him, but additional funds would be required from the University. The details were quickly arranged when Professors Aronszajn and Diamond visited the University at commencement time, and their move to Lawrence was set for the end of the summer of 1951.

Professor Guy W. Smith had reached the mandatory retirement age for administrative positions, and I succeeded him as chairman of the Department on July 1, 1951. I do not know whether there was any consultation with other members of the Department about my appointment, but as far as I know, I held my position as chairman by virtue of my appointment by the University administration. Dean Lawson told me that he was reluctant to appoint me because I "worked too hard". My appointment had been preceded by a number of committee assignments, including committee chairmanships, which I am sure Dean Lawson considered a part of a testing and training period.

The arrival of Professor Aronszajn and his group from Oklahoma State University greatly strengthened the Department's graduate program. Professors Aronszajn and Diamond were appointed to visiting professorships (Professor Aronszajn was appointed to a visiting professorship because he did not have United States citizenship at that time), and Professor Arthur N. Milgram, formerly at Notre Dame and Syracuse, was appointed to a visiting associate professorship for 1951-1952. Aronszajn and Diamond brought four graduate students with them from Stillwater: Alan K. Jennings, George B. Pedrick, Bobby J. Hollingsworth, and Arthur J. Zeichner. Jennings received his Ph.D. degree in 1954, and Pedrick received his in 1958; both wrote theses under Professor Aronszajn's supervision. Hollingsworth received his Ph.D. degree in 1955 for a thesis supervised by Professor P. O. Bell.

Professor S. S. Shrikhande was a visiting assistant professor from 1951 to 1953. A specialist in statistics, he was an excellent research man. He solved a problem that had been unsolved since the time of Euler, but he was less successful as a teacher. As a result of my war experience in operations research, I had developed two good courses in statistics--an elementary course and a more advanced one based on calculus. The elementary course regularly drew enrollments of fifty to sixty students from other departments. This promising program declined when a visitor became the instructor.

Soon after I became chairman, I made a change designed to strengthen the mathematics programs in high schools that sent students to The University of Kansas. The School of Engineering, with encouragement from the Department of Mathematics, required all of its students to take college algebra (Mathematics 2a or 2c) and trigonometry (Mathematics 3) regardless of whether or not they had had these courses in high school. It seemed obvious that the high schools would be unable to develop good mathematics programs as long as the University demonstrated its lack of confidence in their ability to teach algebra and trigonometry. The requirements were modified so that anyone who could demonstrate on a placement examination that he knew algebra and trigonometry was not required to enroll in these subjects. This recognition of the work of the high schools helped them to strengthen their mathematics programs; also it helped the University's students, and decreased somewhat the teaching load of the Department of Mathematics.

When the Korean War broke out in 1950, the Department of Defense called on scientists and mathematicians once more--but in a different way. The Office of Naval Research stated that, whereas in World War II scientists and mathematicians had left their universities (had been taken away from their normal activities!)

and participated full-time in war activities, for the Korean War, it would be necessary for these groups to continue their university responsibilities and to help with the war effort in addition. The Office of Naval Research organized a group at The University of Kansas (physicists, chemists, engineers, and myself) which was taken to Washington to hear briefings on Navy problems that might become research projects on the Lawrence campus. Some of the engineers became involved in a study of catapult launching of airplanes from aircraft carriers, but I was not involved in any defense studies as a result of these ONR efforts.

The Weapons Systems Evaluation Group (WSEG) was an operations research group that served the Joint Chiefs of Staff in the Pentagon; Dr. H. P. Robertson, a mathematical physicist from the California Institute of Technology, was its director in 1951. Dr. Robertson had been a member of the Operational Research Section at Headquarters Eighth Air Force for several months, but he had departed before I arrived in 1943. In 1951 Dr. Robertson asked The University of Kansas to give me a leave of absence so that I could spend a year working for WSEG. Chancellor Malott declined to do so. I did spend the month of August 1951 at WSEG, however. It was a frightening and depressing place to be because of access to secrets about weapons and war plans and because of the rigid security measures. In order to work there, I was required to obtain a Q-clearance, a security clearance that gave me access to information about nuclear weapons.

In the spring of 1952 I received an unexpected and puzzling telephone call from Mina Rees in ONR; she asked me to come to Washington on a certain day, and added that my travel expenses would be paid through the ONR contract of Dr. Cora Downs in our Department of Bacteriology. What could Mina Rees want?--the clues did not seem very revealing! When I arrived in her office on the appointed day, she brought in a group of Navy officers who described a project which they asked me to undertake during the summer of 1952. The project was a defensive study related to the Korean War, but since it had a SECRET security classification, I shall not describe it. I returned to Lawrence, consulted the University administration, and reported to Mina Rees that I would undertake the assignment. There were two reasons why this assignment came to me: first, I had had experience in operations research during World War II; second, the Department of Mathematics was expected to contribute to the national defense because it had received ONR contracts to support research in mathematics.

I organized a group of ten persons as quickly as I could to form the staff for the ONR project in the summer of 1952. The group included myself, Dr. Cornelia M. Downs, Dr. Ted Metcalf, Professor W. R. Scott, Mr. William Calvin Foreman (a graduate student who received his Ph.D. degree in 1952 and who has taught mathematics at Baker University since that time), Mr. Lester E. Laird (a graudate student in mathematics who is now a member of the faculty of Kansas State Teachers College in Emporia), Professor Albert Palmerlee from the Department of Engineering Drawing, a capable secretary from the staff of the University's Department of Secretarial Training, and two others. Dr. Downs and Dr. Metcalf were bacteriologists; Dr. Downs was world-famous for her research on tularemia. She had worked at Camp Detrick in Maryland during World War II, where she was in charge of a staff of forty scientists and technicians [Distinguished Graduates of K. U. 19, 20, 21]. Security clearances were an urgent necessity for members of the group. I ordered a safe to hold SECRET Navy documents, but its delivery was so slow that I eventually borrowed a safe of Captain Terrell, Commandant of the University's Navy ROTC. On June 1, 1952, the entire group flew to Washington for ten days of briefings and visits to Navy and other installations. The Navy flew us to Norfolk where we inspected the huge Navy supply base. We visited Camp Detrick in Maryland, the nation's center for research on biological warfare. At the end of ten days we returned to Lawrence and established our project in a large room on the east side of the second floor of Marvin Hall (the arrangement and isolation of the room made security problems easier!). Our return to Lawrence coincided with the beginning of fearfully hot, dry summer weather. There was no air conditioning then, and the area behind Marvin Hall was a gravelled parking lot; the hot wind blew from the southwest--blew the dust from the parking lot through our open windows. The Navy attached a Lieutenant Commander to our group to facilitate the transmission of secret documents for our study. He found life difficult with a civilian research group; almost everything he observed offended his Navy sensibilities. But in spite of the heat and the dust, in spite of the unfamiliarity of the problem assigned to us, and in spite of the shortness of the summer, we wrote and typed (in a form ready for reproduction) a two-hundred-page report. Because of its SECRET classification, the Navy would not permit us to reproduce it on the campus nor to have a copy later. Accordingly, on Sunday, August 31, 1952, I went to Washington by airplane to deliver in person the one and only copy of our report, entitled "Biological Warfare and the Navy Supply System". The Navy appreciated our efforts and it seemed highly pleased with our report. This project was my last involvement in war work; after that my security clearance lapsed, and I have not been called on again to participate in defense activities. On the way home from Washington, I attended the summer meetings of the mathematicians at Michigan State University in East Lansing.

In the summer of 1952 I became more deeply involved in the national affairs of the mathematicians. First of all, I was elected a member, from the Kansas Section, of the Board of Governors of the Mathematical Association of America (as an editor of the *Bulletin of the American Mathematical Society*, I was already a member of the AMS Council). Thus began my membership in the Board of Governors of the MAA--a membership which has continued to the present day. I was elected a Vice President of the MAA for the two years 1955 and 1956; I was President during 1957 and 1958; and then I served for six years on the Board of Governors as a former President. In January 1964, I was elected a member of the MAA Finance Committee, a position which provided ex-officio membership on the Board of Governors. My second four-year term on the Finance Committee ended in January 1972, and I was elected to a third term at the meetings in Las Vegas; I was elected to a fourth term in January 1976 in San Antonio.

Another unexpected involvement in the national affairs of the mathematicians occurred in June 1952. The National Research Council had recently established a Division of Mathematics, and Professor Marston Morse, a member of the Institute for Advanced Study and earlier one of my teachers at Harvard University, was its chairman. In June 1952, I received a letter from Professor Morse stating that he had appointed me Chairman of the Committee on the Regional Development of Mathematics of the Division of Mathematics of the NRC. The other members of the committee were Professor W. M. Whyburn of the University of North Carolina, Professor W. L. Duren, Jr., of Tulane University, Professor Burton W. Jones of the University of Colorado, and Professor Carl B. Allendoerfer of the University of Washington [Price 21, pp. 6-12; 22, 113-122]. Hillier Krieghbaum and Hugh Rawson, in *An Investment in Knowledge* [Price 22], have given a rather full account of the assignment of this committee and of its early work. I visited Washington, D. C. during the last week of July 1952, and there I talked with Harry C. Kelly of the National Science Foundation and Mina Rees of the Office of Naval Research about their ideas concerning the work of the Committee on the Regional Development of Mathematics. Also that summer (probably in connection with my July trip to Washington) I visited Duke University and talked with officials of the Office of Ordnance Research located there. The committee held a meeting in connection with the summer meetings of the mathematicians in East Lansing, Michigan on September 3, 1952, but much of its work was carried on by extensive correspondence. The committee also held a meeting in Washington in November. I remember it as a two-day meeting, and one of the days was November 20. Professor Lefschetz was one of those whom the committee invited to meet with it. Krieghbaum and Rawson have reported this meeting as follows [Price 22, p. 119]:

> The Committee on Regional Development of Mathematics, meeting in Washington with a number of non-committee mathematicians, voted on Nov. 20 to recommend to NSF that an institute be held at the University of Colorado "for the purpose of bringing together teachers of mathematics in good colleges in an environment in which they can learn new developments in the field and obtain inspiration for their teaching; and that the staff and program of the Institute be arranged subject to the approval of the Committee on Regional Development of Mathematics." The committee also discussed a tentative list of lecturers for the institute.

As a result of this recommendation, the first NSF summer institute in mathematics was held at the University of Colorado during the summer of 1953; it was an institute for college teachers. I had tried hard to obtain this institute for The University of Kansas; I was at a disadvantage because I was chairman of the committee. In the end the University of Colorado won the competition because of Boulder's better climate and more attractive surroundings (mountains!).

Thus, the Committee on the Regional Development of Mathematics, at its November 1952 meeting in Washington, helped the National Science Foundation to establish its summer institute program by locating the first mathematics institute at the University of Colorado in the summer of 1953. Two other actions helped to make the November meeting in Washington a notable one. The committee recommended that the National Science Foundation establish a program of visiting lecturers, which it did with outstanding success. I served as a visiting lecturer for the Mathematical Association of America in the spring of 1956, and the MAA operated a program of visiting lecturers with NSF support through the 1971-1972 academic year. The Committee on the Regional Development of Mathematics, as its third action at its November 1952 meeting, voted to recommend to the Mathematical Association of America that it undertake a revision of the college curriculum in mathematics. This recommendation was presented to the MAA Board of Governors at its Christmas, 1952, meeting in St. Louis. The Board of Governors authorized the incoming president, Professor E. J. McShane, to appoint the first Committee on the Undergraduate Program. Professor McShane appointed the new committee (called CUP) in January 1953, with Professor Duren as its chairman; Professor A. W. Tucker and I and several others were members. The history of CUP and its successor, CUPM, can be found in their reports and in the volumes of the *American Mathematical Monthly*. CUP and CUPM have had enormous influence on the teaching of mathematics in the colleges and universities of the United States; CUPM continued until the early 1970's, when NSF withdrew its support from course content improvement projects in all fields.

A brief paragraph will complete the history of my connection with the Committee on the Regional Development of Mathematics. In its later efforts the Committee tried to do something to obtain a wider distribution of fellowship support for the study of mathematics. The new Chairman of the Division of Mathematics of NRC did not approve these efforts. The committee's goals were achieved much later, however, through the inclusion of funds for research assistants in research grants and contracts and by the establishment of the NSF and NASA traineeship programs and the NDEA fellowship program. I served for two years on the Committee on the Regional Development of Mathematics, from 1952 to 1954.

While these committee activities were in progress, important developments were taking place for The University of Kansas and the Department of Mathematics. There were important additions to the staff. First of all, William F. Donoghue, Jr. and Kennan T. Smith were appointed to assistant professorships in 1952-1953. Both had received their Ph.D. degrees from the University of Wisconsin in 1951; their theses, written under the supervision of Professors Laurence C. Young and William F. Eberlein, were published as a joint paper in volume 73 (1952) of the *Transactions of the American Mathematical Society*. Professor Donoghue had spent the year 1951-1952 as an Associate Mathematician at the Applied Physics Laboratory of Johns Hopkins University, and Professor Smith was a Fulbright scholar in France during 1951-1952. Professors Donoghue and Smith were associated with Professor Aronszajn's research project and taught in the Department as regular members of the staff.

Professor A. N. Milgram was a visiting staff member during 1951-1952, and Professor John LeRoy Kelley was a visitor during 1952-1953. Professor Kelley, normally a member of the Department of Mathematics of the University of California at Berkeley but a refugee from Berkeley since 1950 because of the California loyalty oath, had spent the years 1950-1951 and 1951-1952 at Tulane University in New Orleans. Professor Kelley spent the year 1952-1953 as a Visiting Associate Professor at The University of Kansas. I had hoped to keep him permanently, but Berkeley made its peace with him in the spring of 1953 and he returned to California at the end of that summer.

Professor Kelley had written his *General Topology* at Tulane University between 1950 and 1952 (it was not published until 1955); during 1952-1953 he organized a group to write a book on linear topological spaces during the summer of 1953. Kelley was encouraged in this undertaking by the availability of staff members who knew the subject and also some excellent graduate students; furthermore, he received a grant from the University's general research fund to support the project. During the summer of 1953 Kelley's group wrote a first draft of a book entitled *Linear Topological Spaces*; it was typed and dittoed and bound in paper covers in three volumes. We produced fifty-five sets of three volumes each--and the Department had only a hand-operated ditto machine in those days! Those who worked on the project in the summer of 1953 were the following: J. L. Kelley, Isaac Namioka, W. F. Donoghue, Jr., Kenneth R. Lucas, B. J. Pettis, Ebbe Thue Poulsen, G. B. Price, W. R. Scott, and Kennan T. Smith. Isaac Namioka, a student from Japan, had graduated from Ottawa University in Ottawa, Kansas, and had come to The University of Kansas to study mathematics. He followed Professor Kelley when Kelley returned to Berkeley. Namioka received his Ph.D. degree from Berkeley for a thesis written under Professor Kelley's supervision; he is now a professor at the University of Washington in Seattle. Kenneth R. Lucas was one of the Department's graduate students; he received his Ph.D. degree in 1957 and later held a position on the faculty of the Navy Postgraduate School in Monterey, California. Professor B. J. Pettis, in 1953 on the faculty of Tulane University but for many years now at the University of North Carolina, was a visiting member of the summer project. Ebbe Thue Poulsen, from Denmark, was one of the Department's most brilliant graduate students; he is now a professor at Aarhus University in Denmark. Professors Donoghue, Scott, K. T. Smith, and I were regular members of the Department's staff. When *Linear Topologists Spaces* was finally published in 1963, the title page carried the names of ten authors [Price 9]. J. L. Kelley and Isaac Namioka were listed as the principal authors because they had borne the full responsibility for rewriting the 1953 draft to make the final version. The name of Wendy Robertson was added to the list of other authors given above; she helped with the preparation of the exercises in the final version. (Professor and Mrs. Alexander P. Robertson--in 1963 at the University of Glasgow in Scotland, later at the University of Keele in England, and now in Perth, Australia--were visiting members of the Department during 1959-1960.) Since the first draft of *Linear Topological Spaces* was written with financial support from The University of Kansas, the authors assigned the royalties to the Endowment Association and later requested that they be added to the Guy W. and Linda P. Smith Fund which supports a lectureship in the Department of Mathematics. Professor Haruo Murakami, who was a member of Professor Aronszajn's research project from 1963 to 1965, has translated *Linear Topological Spaces* into Japanese.

Robert Vosper, formerly at the University of California at Los Angeles, became the Director of Libraries in 1952, and the University Libraries prospered under his leadership. Chancellor Murphy had a deep interest in building up the libraries of the University, and he gave strong support to Robert Vosper. These two became an aggressive and formidable team, well-known to booksellers and other librarians. They essentially doubled the number of volumes in the library between 1952 and 1961 [*The Graduate Magazine* 128-135].

The visits by distinguished mathematicians that began when Professor Aronszajn arrived in 1951 continued during 1953-1954. During this year the Department had a contract from the Air Force Office of Scientific Research. Professor Gustave Choquet from the University of Paris was a visiting professor working on this project during the fall semester of 1953, and he wrote an important report (later published also in France) entitled "Theory of Capacities". During the spring semester of 1954 Professor Marcel Emile Brelot, also from the University of Paris, was a visiting professor working on the same project.

Professor Brelot was engaged in research on harmonic functions.

Sydney Henry Gould was a Visiting Assistant Professor in the Department during the academic year 1953-1954. In 1947 Gould had been an Associate Professor of Classics in the University of Toronto, but he resigned and accepted a position as Assistant Professor of Mathematics at Purdue University. He had originally become interested in mathematics as a result of reading Archimedes in the original Greek, and his interest in the subject was heightened by his defense-related mathematical research in Canada during World War II; he finally made the change to mathematics because he had so few students in classics. Professor Gould wanted to spend a year at The University of Kansas while he completed a book related to some of the research of Professor Aronszajn. Professor Gould's book was published as follows:

> *Variational Methods for Eigenvalue Problems: An Introduction to the Methods of Rayleigh, Ritz, Weinstein, and Aronszajn.* Toronto: University of Toronto Press, 1957. 179 pages.

Professor Gould was Executive Editor of *Mathematical Reviews* from 1956 to 1962; from 1962 to 1972 he was Editor of Translations for the American Mathematical Society; since 1972 he has been in Taipei, Taiwan as consulting editor of the *Bulletin of the Institute of Mathematics, Academia Sinica*. Professor Gould is a truly gifted linguist, and in recent years he has used his gifts on behalf of mathematics.

Professor Lefschetz retired in June 1953 from his position as Henry Burchard Fine Professor of Mathematics and Chairman of the Department of Mathematics of Princeton University; arrangements were made for Professor and Mrs. Lefschetz to visit Lawrence to renew acquaintances with old friends during the period October 18-22, 1953 [*University Daily Kansan* 1]. Professor Lefschetz gave two talks on algebraic topology for the mathematicians; the first at 4:00 p.m. on Monday, October 19, and the second at 8:00 p.m. on Tuesday, October 20. He also gave a talk to the Mathematics Club on "The Role of Mathematics in the World Today". Finally, Professor Lefschetz gave a lecture for the public entitled "What is Topology?" at 8:00 p.m. on Wednesday, October 21, in Strong Auditorium; after the lecture there was a reception for Professor and Mrs. Lefschetz in the Faculty Club. Professor and Mrs. Lefschetz stayed in the chancellor's guest house, and, although the schedule seems strenuous, there was time for visits with Dean Stouffer and Professors G. W. Smith, Wheeler, Jordan, Babcock, and Black--all of whom had been in the Department when Professor Lefschetz was at The University of Kansas. It is likely that Professor Lefschetz took some of the walks with Professor Wheeler that he recalled so fondly in his reminiscences [Lefschetz 1]. Viewed in retrospect, the visit of Professor and Mrs. Lefschetz in 1953 seems a brief interlude between his career at Princeton University and the new career which he developed after his retirement there. An article which I wrote for the *Alumni Magazine* [Price 8] contains a group photograph which includes Professor and Mrs. Lefschetz and also a photograph of Professor Nachman Aronszajn and Gustave Choquet.

Dean Paul B. Lawson was scheduled to retire from his position as Dean of the College of Liberal Arts and Sciences at the end of June 1954, and his successor had already been appointed. In the spring of 1954, however, he suffered a severe heart attack and died a few days later (March 30, 1954); his untimely death seemed a cruel fate for one who had served the University and its students with almost religious devotion for so many years [*The Graduate Magazine* 107, 108]. Dean Lawson had been born in India of missionary parents, and he and Mrs. Lawson had planned to make a trip to the country of his birth after he retired from his position as Dean of the College. George R. Waggoner, a 1936 graduate of The University of Kansas, who was then at Indiana University, was appointed Professor of English and Dean of the College of Liberal Arts and Sciences to succeed Dean Lawson [*The Graduate Magazine* 109, 110].

The staff of the Department of Mathematics received an important permanent addition in February 1954 with the appointment of Russell N. Bradt, a specialist in statistics. (S. S. Shrikhande, the statistician first appointed in 1951, was not reappointed for 1953-1954.) Bradt received his Ph.D. degree, in statistics, from Stanford University in 1954 and immediately joined the staff of the Department. Professor Bradt had served in the Army Air Forces from 1943 to 1946; he received training as a meteorologist at Massachusetts Institute of Technology and was on active duty afterward in North Africa. He received an A.B. degree from Colorado State College of Education at Greeley in 1946 and an M.A. degree, also from Greeley, in 1948. I attracted Professor Bradt to the study of statistics by a talk I gave in Greeley in the summer of 1948, but he taught in a high school in Wallace, Idaho during 1948-1949 and did not arrive at The University of Kansas as a graduate student until September 1949. He wrote a master's thesis on a problem in probability theory under my supervision and received his M.A. degree in 1951. I assisted him in obtaining an opportunity to study statistics at Stanford University, where he wrote his Ph.D. thesis under the supervision of Samuel Karlin. Professor Bradt assumed the leadership of the Department's program in statistics when he joined the staff in 1954.

The MAA Committee on the Undergraduate Program, with W. L. Duren, Jr., as chairman, held its first meeting about the end of May 1953, in Washington. The occasion is well remembered in my family because my twin daughters were born on the afternoon of May 27, 1953, while I was flying to Washington to attend the meeting; Professor Kelley asked TWA to notify me, and TWA delivered the message to me on the airplane. At this meeting of the committee and at later ones, plans were made for a 1954 summer writing session; it was held in Lawrence because The University of Kansas provided the major share of the financial support for it. The University made a grant of about $5,000 for the use of the committee and an additional $2,500 was obtained from the Social Science Research Council. The 1954 Summer Writing Group of the Department of Mathematics of The University of Kansas consisted of F. A. I. Bowers, Jr. (a graduate student at Kansas from Hawaii), R. N. Bradt, C. E. Capel (a former graduate student at Tulane), W. L. Duren, Jr., G. B. Price, and W. R. Scott. We were assisted by a full time typist, a Miss Jo Ann Bethurum and a part time draftsman, Mr. Dayle Bockhorst. This group wrote *Universal Mathematics, Part 1, Functions and Limits* and a first draft of *Part 2, Structures in Sets*. Part 2 dealt with sets, probability, and some simple mathematical structures. Part 1 had the subtitle *A Book of Experimental Text Materials*; it was printed at The University of Kansas in August 1954, and it was used as an experimental textbook in classes at The University of Kansas and at Tulane University during 1954-1955 [Price 11]. Part 2 was revised during 1954-1955 at Tulane University; after contributions by several additional authors it was edited into final form by Robert L. Davis at the University of Virginia and published by the Mathematical Association of America in 1958 [Price 12] under the title *Elementary Mathematics of Sets, with Applications*.

An evaluation of the 1954 Summer Writing Group is in order. *Universal Mathematics, Part 1, Functions and Limits* was intended to be an introduction to analytic geometry, the elementary functions, and the differential and integral calculus. There was a dual treatment that ran through the book; on one page there was a "logical" exposition of the subject, and on the opposite page, an "intuitive" treatment with applications. Everyone agreed that this arrangement was confusing, and it was abandoned when the book was reprinted in 1958. The title *Universal Mathematics* was an appealing one, but the book was not a simple one--it is probably the only freshman book ever written that contained Moore-Smith limits. Many free copies of the book were distributed, and I well remember the scathing letter I received from a dean in a small college who had assumed that *Universal Mathematics* must be the answer to all of his troubles--only to discover to his sorrow that it was more difficult than anything he had tried up to that time! *Elementary Mathematics of Sets, with Applications* proved to be more successful. *Universal Mathematics* was written in approximately two months under difficult circumstances. The hot, dry summers that had begun with the Navy project in 1952 had continued. The official temperature reached 117°F. in Lawrence in the summer of 1954, and there was no air conditioning. The writing, polishing, and editing of *Elementary Mathematics of Sets, with Applications* extended over a full three years, however, and the results were inevitably much better. The book received from the Turkish government what was probably its highest compliment: the Turkish government paid the MAA for the privilege of translating it into the Turkish language.

The 1954 Summer Writing Group surely set some records that still stand: six authors and one typist wrote and published one book and wrote a first draft of a second book--all in one summer and with total expenditures of considerably less than $7,500!

But the real significance of the 1954 Summer Writing Group lay not in the two books it produced, for they were not long or widely used as textbooks, but rather in the fact that it was the first real effort at curriculum revision in the fields of science and mathematics in the United States. Max Beberman had barely begun his work on high school mathematics courses at the University of

Illinois, but no real efforts had been initiated in the fields of chemistry, physics, biology, geology, and engineering, either at the high school or college level. The 1954 Summer Writing Group, by initiating the work on modernizing the college curriculum in mathematics recommended by the NRC Committee on the Regional Development of Mathematics in 1952, prepared the way for the Commission on Mathematics in 1955, the School Mathematics Study Group in 1958, and the Committee on the Undergraduate Program in Mathematics after 1960. The 1954 Summer Writing Group was a pioneer effort in the curriculum improvement movement of the late 1950's and the 1960's.

As had been expected, the Department was successful in its efforts to obtain funds from the federal government to support its program. In addition to Professor Aronszajn's ONR contract and the contract from the Air Force Office of Scientific Research that was used to support Choquet and Brelot during 1953-1954, the Department received a grant (Research Grant NSF-G 1126) from the National Science Foundation for a "Research Project on the Geometry of Function Space". Leon Cohen in the National Science Foundation deliberately gave the project a meaningless title so that it could be used to support almost any research the Department might wish. This grant was used to support Alexandre Grothendieck from Paris during the spring semester of 1955. While he was in Lawrence, Grothendieck wrote the following report:

> *A General Theory of Fibre Spaces with Structure Sheaf.*
> Department of Mathematics, The University of Kansas, 1955.
> 100 pages. Red paper covers.

This report was issued as one of "the red reports" for which the Department became famous. This report was issued in revised form later, and the revised form has been reprinted once; it is still in demand in 1976.

In 1955 Professor George Springer was appointed to an Associate Professorship. Professor Springer was an excellent teacher, and he was unusually energetic in promoting the Department's educational activities of all kinds, including the revision of courses, summer institutes for high school and college teachers, and undergraduate research participation projects. At the present time he is a member of the staff of the Department of Mathematics at Indiana University (see his biography in the Eleventh Edition, 1967, of *American Men of Science* [S, Appendix IX, Springer]).

Under Dr. Murphy as chancellor, The University of Kansas began strenuous efforts to develop itself into a scholarly institution. Dr. Murphy, assisted by Robert Vosper, began the development and expansion of the university libraries soon after he became chancellor. The program of distinguished professorships which came later [*The Graduate Magazine* 114-117; Distinguished Graduates of K. U. 21] was designed to help build the distinguished faculty required for a university of the first rank. Teaching and instruction at the undergraduate level were not overlooked; the Honors Program which Dean Waggoner established with such notable success provided a program of excellence for gifted undergraduates [*The Graduate Magazine* 112]. Dr. Wescoe maintained that teaching and research are inseparable, and for this reason he declined to give the title "Research Professor" to any member of the faculty. Dr. Wescoe feared that the legislature might be tempted to curtail or even abolish research at some future time when the financial support of the University became difficult.

The Department of Mathematics participated in all of these efforts to build a scholarly University. I felt that the only way to insure progress and success for the Department's research and graduate program was to maintain an excellent program of instruction, beginning with the freshman year. The Department still had serious needs. It had been able to obtain some funds from ONR, NSF, and OSR to support its research, and these funds had helped it to attract some excellent mathematicians to its staff, but there were still serious shortages of staff and students. Many of the elementary courses were being taught by temporary instructors and even housewives who had had some training in mathematics. The Department was unable to obtain enough graduate students to fill its needs for assistant instructors. There seemed to be no easy solution to these problems, and I engaged in activities of many kinds in an effort to develop a distinguished Department of Mathematics. There were efforts to attract high school students to the study of science and mathematics; the Science and Mathematics Days that were held on the campus were one part of this effort. There were efforts to attract college students to the study of mathematics and to improve the teaching of mathematics in colleges; as one part of these efforts, I served as a visiting lecturer of the Mathematical Association of America during the spring of 1956. There were efforts to improve the teaching of mathematics in both high schools and colleges, and the program of National Science Foundation summer institutes for high school and college teachers of mathematics which the Department began in the summer of 1957 formed a major part of these efforts. Finally, there were efforts to improve the Department's program of instruction at the undergraduate level: courses were revised; an honors program was established; and in 1960 an NSF undergraduate research participation project was established.

The Fourth Annual Science and Mathematics Day, held on Saturday, October 29, 1955, is a good example of one type of effort that the University made to promote science and mathematics in the mid-1950's. The Science and Mathematics Days were an outgrowth of a one-day conference organized by one of the chemistry professors to help high school teachers of science. By 1955 Science and Mathematics Day had become a large annual event. The Day was designed to recruit students to the study of science and mathematics; there was a deliberate effort to avoid using the Day to recruit students for The University of Kansas. The design of the Day was based on the principle that a student must be acquainted with, and informed about, a subject in order to become interested in it. Accordingly, the science departments opened their laboratories and displayed special exhibits and demonstrations that had been prepared for the occasion. In addition, there were two or three major lectures, with at least one featured speaker from outside the University.

I was the chairman of the committee that arranged the Fourth Annual Science and Mathematics Day in 1955. I had observed that the magazines and newspapers gave very poor coverage to science and mathematics, and I discussed this situation one day with Alvin McCoy, Kansas correspondent for the *Kansas City Star* [Distinguished Graduates of K. U. 22, 23, 24]. Mr. McCoy had graduated from The University of Kansas with a major in chemistry, but he had achieved a brilliant career in journalism. As a war correspondent in the Pacific, he had covered the landing on Iwo Jima; he had won a Pulitzer Prize for some especially important political reporting from Topeka. Later still, Mr. McCoy became science editor for the *Kansas City Star*.

One day when I berated Mr. McCoy for not writing more about science and mathematics, and especially about our Science and Mathematics Days, he replied, "Well, if you will get somebody to talk about space travel at the next Science and Mathematics Day, I will write about it".

"That's a bargain", I replied. "I will get someone to talk about space travel".

The man selected to talk about space travel was Dr. Richard W. Porter. He had graduated from The University of Kansas as an electrical engineer in 1934, and he had achieved a distinguished career at the General Electric Company [Porter 1-3]. He had designed the fire-control system of the B-29 airplane in World War II, and he had been made general manager of General Electric's new guided missile department in 1953.

Dr. Porter's talk exceeded our fondest expectations. He began by saying that he proposed to make predictions about some of the things science would accomplish in the future. He pointed out that scientists had frequently made predictions in the past, but that their predictions had usually been wrong because they were too conservative. "For example", Dr. Porter said, "Robert A. Millikan (the distinguished physicist who measured the charge on the electron and later became President of California Institute of Technology) stated about 1938 that, although there might be some energy in the nucleus of the atom, the amount was so minute that it would never have any commercial significance. But today there are nuclear powered ships". Then Dr. Porter began his own predictions with the following startling statement: "The United States can put a man on the moon within twenty-five years if it decides to invest the necessary money and talent in the effort". I did not believe him. *The Graduate Magazine* reports as follows that he made further predictions [Porter 4].

> In his speech for K. U.'s Fourth Annual Science and Mathematics Day, Dr. Porter made some fascinating predictions for the world of the future. In fifty years, he said, we will have--
>
> ... knowledge of how to tap unlimited sources of energy ... that will last as long as the earth lasts ...
>
> ... power so cheap it will not need to be metered, but can be sold on the basis of a connection charge ...

> ... unlimited food supplies ...
>
> ... textiles at low cost as well as most metals and plastics ...
>
> ... freedom from the drudgery of repetitive and unimaginative tasks ...
>
> ... replacement of bookkeepers, the Post Office, the stockroom keeper, the shipping clerk, and the engineering data file by electronic computers.

A front-page article in the *University Daily Kansan* for the following Monday adds the following information about the day's events [*University Daily Kansan* 2]:

> Earlier on the morning program, Dr. H. A. Wenner, professor of pediatrics, spoke on the "Development of the Salk Polio Vaccine."
>
> Dr. Wenner traced the development of the Salk anti-polio vaccine, pointing out that poliomyelitis has changed since 1930 from a disease principally affecting children under 2, to one which usually attacks persons between the ages of 5 and 15.
>
> Dr. Wenner called the Salk vaccine "one of the greatest medical discoveries in recent years," and predicted that the vaccine will be perfected in the near future.

Dr. P. C. Sylvester-Bradley, Visiting Rose Morgan Professor, spoke on "Life in Other Worlds" at a luncheon in the Kansas Room of the Union. The committee had scheduled this talk with much trepidation, fearing that the subject was too speculative to be interesting, but those who heard Professor Sylvester-Bradley were fascinated.

A second article on the front page of the *University Daily Kansan* supplies the following additional information about the 1955 Science and Mathematics Day [*University Daily Kansan* 3].

More than 800 high school students, teachers, and parents were welcomed to the fourth annual Science and Mathematics Day, Saturday by Chancellor Franklin D. Murphy.

Guests spent the day listening to speakers and visiting the various exhibits and displays set up by the science and mathematics departments.

A luncheon and entertainment for the students was held in the Student Union Ballroom and the teachers attended a luncheon in the Kansas Room of the Union.

The largest group present was the 86 students from Wyandotte High School in Kansas City, Kan. The second largest were the 85 from Topeka High School. Third were 47 students from Columbus.

Students travelling the farthest to attend the fair were six students and two sponsors from Dodge City High School and five Hays High School students and sponsors.

Alvin McCoy kept his part of the bargain: he reported the Fourth Annual Science and Mathematics Day in a leading article with a big headline on the front page of the *Kansas City Star* for Sunday, October 30, 1955.

While the annual Science and Mathematics Days were informing the high schools and the public about current developments in science, the University's chapter of Sigma Xi was continuing to play a similar role within the University and to be a unifying influence among the scientists on the faculty [Sigma Xi 1, 2, 3]. The monthly meetings were well attended; the program was usually supplied by a single speaker. Refreshments were always served after the meetings; these refreshments were simple--cider and doughnuts or something similar--but they promoted acquaintance with other members of the faculty, conversation, and a feeling of common purpose among the scientists in the University. I had been elected to Sigma Xi at the University of Rochester; there I participated in Rochester's Science and Mathematics Day, held on the February 22 holiday for the school children of the city. I continued my Sigma Xi activities at The University of Kansas. Soon after coming to Lawrence, I gave a talk entitled

"Some Famous Problems of Modern Mathematics", which was highly successful from everyone's point of view. I served on the Sigma Xi program committee, and I remember persuading Chancellor Malott to invite Dr. Irving Langmuir, the famous General Electric chemist in Schenectady, to visit the University and to give a Sigma Xi lecture; unfortunately, Langmuir declined the invitation. I served as the vice president of the K. U. chapter of Sigma Xi from 1952 to 1954 and as president from 1954 to 1956. After that, other activities left me little opportunity to participate actively in the affairs of Sigma Xi.

Revision and modernization of the Department's courses began with the work of the 1954 Summer Writing Group, sponsored by the Department and by the MAA's Committee on the Undergraduate Program. The influence of CUP can be traced clearly in the evolution of the Department's new courses. As described above, the 1954 Summer Writing Group wrote *Universal Mathematics, Part 1, Functions and Limits*, and a first draft of *Universal Mathematics, Part 2, Structures in Sets*. (Part 2 was revised and completed in 1955 with the help of the CUP and a Tulane University Writing Group.) These two parts of *Universal Mathematics* were used in experimental sections taught by the Department during 1954-1955. For many years the beginning sequence of mathematics courses had consisted of college algebra (Mathematics 2a or 2c), trigonometry (Mathematics 3), analytic geometry (Mathematics 4), and calculus I and II (Mathematics 5 and 7). The catalog for 1955-1956 lists the following new courses:

Mathematics 21. Functions and Limits (5)
Mathematics 22. Structures in Sets (5)
Mathematics 23. Calculus and Analytic Geometry I (5)
Mathematics 24. Calculus and Analytic Geometry II (3)

The 1938-1939 catalog was the first one to describe a program leading to "Honors in Mathematics". This early honors program consisted of Mathematics 91 and 92, Honors Courses I and II. It was thus a program which began in the junior year and consisted entirely of independent reading in the material of standard courses or perhaps other material. This early honors program never prospered--almost no students enrolled in it--, but the description of it and of the honors courses Mathematics 91 and 92 continued to appear in the University catalog through 1957-1958. Thus, before the old honors program was abandoned, the following new sequence of honors courses appeared in the catalog for 1956-1957:

Mathematics 31. Calculus and Analytic Geometry I H (Honors Course) (5) Vector analysis in n dimensions; introductory differential and integral calculus; applications. Prerequisite, permission of the Department of Mathematics.
Mathematics 32. Calculus and Analytic Geometry II H (Honors Course) (5)
Mathematics 33. Calculus and Analytic Geometry III H (Honors Course) (5)
Mathematics 34. Calculus and Analytic Geometry IV H (Honors Course) (3)

This sequence of four honors courses shows the influence of Princeton University and of the MAA's Committee on the Undergraduate Program. CUP recommended honors courses, and with the help of Professor A. W. Tucker it obtained a paperback edition of part of Professor Emil Artin's honors course at Princeton (the paperback was never published as a book because of Professor Artin's opposition: "My words without me are not the same!"). The statement "vector analysis in n dimensions" refers specifically to the Artin paperback, for this was the first topic in the book. The University catalog for 1957-1958 included Mathematics 41, 42, 43 as an additional, top-level sequence of honors courses;

Mathematics 21, 22, 23, 24 and Mathematics 31, 32, 33, 34 were still listed. These courses took their final form in the catalog for 1958-1959. Mathematics 21, 22, 23 became the standard sequence in calculus and analytic geometry, and Mathematics 41 H, 42 H, 43 H became the honors sequence. The Department decided that three levels were too much, and, although Mathematics 31, 32, 33 were listed for many years, these courses were offered only briefly.

The new honors program prospered from the beginning. The 1938-1939 honors program began at the junior level--too late, because the students had already had two years of mediocre courses. Furthermore, directed reading (independent reading!) is difficult for, and provides no encouragement and inspiration for, most undergraduate students. The 1956-1957 and later honors programs selected the best entering freshmen and gave them a good instructor in a new and exciting course. The students gained inspiration and *esprit de corps* from working together in an interesting course. Moreover, the Department's new honors course soon gained additional support from Dean Waggoner's "special program for gifted students", which appeared in the catalog for the first time in 1957-1958, and which was described more fully by Dean Heller in *The Graduate Magazine* [*The Graduate Magazine* 112]. A photograph which accompanies an article I wrote for the *Alumni Magazine* [Price 13] shows me at the blackboard teaching a section of Mathematics 41 H in the fall of 1957; the material on the blackboard is vector analysis in n dimensions from the paperback book on Artin's Princeton honors course. Two other photographs with the article show two students in the class: Ann Marsh and Cora Lee Price; they were two students in Dean Waggoner's "special program for gifted students".

The NRC Committee on the Regional Development of Mathematics had encouraged the National Science Foundation to establish a program of visiting lecturers. NSF had done so, and the Mathematical Association of America had obtained grants to operate a visiting lecturers' program in mathematics for colleges. Professor W. L. Duren, Jr. was one of the early visiting lecturers, and Professor George Polya was another; a little later Professors A. W. Tucker and John G. Kemeny were lecturers. I was invited to be a visiting lecturer for the MAA in the spring of 1956, and I accepted without hesitation. Although I continued my duties as chairman of the Department, I was not able to teach during the spring semester of 1956, because I was absent from the campus for two and three weeks at a time. A diary which I kept shows that I made the following visits:

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| February 12-15 | University of Arkansas, Fayetteville, Arkansas |
| February 16-17 | Harding College, Searcy, Arkansas |
| February 18-20 | Ouachita Baptist College, Arkadelphia, Arkansas |
| February 21-22 | Arkansas State Teachers College, Conway, Arkansas<br>Hendricks College |
| February 23-25 | Memphis State College, Memphis, Tennessee<br>Southwestern at Memphis |
| March 8 | Ottawa University, Ottawa, Kansas |
| March 11-14 | Denison University, Granville, Ohio |
| March 15-17 | Case Institute of Technology, Cleveland, Ohio<br>Western Reserve University |
| March 19-23 | Wayne State University, Detroit, Michigan<br>University of Detroit |
| March 24 | University of Michigan, Ann Arbor, Michigan<br>Michigan Section of the MAA |
| April 1-4 | Iowa State Teachers College, Cedar Falls, Iowa |
| April 4-8 | Carleton College, Northfield, Minnesota<br>St. Olaf |
| April 9-10 | Macalester College, St. Paul, Minnesota<br>College of St. Thomas |
| April 11-12 | Beloit College, Beloit, Wisconsin |
| April 12 | University of Wisconsin, Madison, Wisconsin |
| April 13-14 | National Council of Teachers of Mathematics Meeting,<br>Milwaukee, Wisconsin |
| April 15-19 | University of Omaha, Omaha, Nebraska |
| April 19-21 | University of Nebraska, Lincoln, Nebraska<br>Nebraska Section of the MAA |

| | |
|---|---|
| May 6-9 | Shippensburg State Teachers College, Shippensburg, Pa.<br>Wilson College, Chambersburg, Pennsylvania |
| May 10-12 | Drew University, Madison, New Jersey |
| May 12 | Commission of Mathematics, Princeton, New Jersey |
| May 14 | Hofstra College, Hempstead, New York |
| May 15-16 | Hunter College, New York City and Bronx, New York |
| May 17 | Skidmore College, Saratoga Springs, New York |
| May 18 | Alfred University, Alfred, New York |
| May 19 | MAA Headquarters, Buffalo, New York |
| May 21 | National Science Foundation, Washington, D. C. |

As a visiting lecturer I tried to strengthen departments of mathematics and to attract students to the study of mathematics. I served as a consultant by giving information about new developments in mathematical affairs and by offering suggestions and recommendations for improving mathematics courses and programs. Talks for teachers usually dealt with curriculum improvement projects such as those of Max Beberman's University of Illinois Committee on School Mathematics, A. W. Tucker's Commission on Mathematics, and W. L. Duren's Committee on the Undergraduate Program. Talks for students were of two kinds: the first dealt with mathematics, and the second described opportunities for employment in mathematics. "Bounds for Determinants with Dominant Principal Diagonal", "Bicomplex Variables", "Derivatives and Jacobians", and "Proof of the Five Color Theorem" were titles of four of the mathematics talks, but the most exciting of my talks was "Some Famous Problems of Modern Mathematics"; it described Waring's Problem, the Jordan Curve Theorem, the Problem of Plateau (with soap film demonstrations), and the Four Color Problem. Many of the small schools I visited had never had a visitor in mathematics; students became interested in mathematics, and departments of mathematics took on new life. The visiting lecturers in those days were the missionaries of mathematics! The nine weeks that I spent as a visiting lecturer were full of interesting experiences, but they constituted one of the most exhausting experiences of my life. On many days I gave from three to five talks and lectures, and I traveled constantly and met large numbers of new people.

But what do my travels as an MAA visiting lecturer have to do with the history of the Department of Mathematics of The University of Kansas. Since I was a visiting lecturer for the MAA, I could not advertize The University of Kansas; nevertheless, I was always introduced as the Chairman of the Department of Mathematics of The University of Kansas. Furthermore, I met many teachers and students, and afterward they found it easy to write to me about arrangements for themselves or their students to attend graduate school. I consider that my travels as a visiting lecturer was the first of several measures I took which eventually provided an adequate supply of graduate students for the Department.

A second measure which I took was to accept an invitation from Professor T. H. Hildebrandt to be a lecturer in an NSF summer institute at the University of Michigan in the summer of 1956. NSF summer institutes in mathematics had been held each summer, beginning with the first one at the University of Colorado in 1953; in 1956 Michigan had an institute for about fifty college teachers. Professor C. C. MacDuffee from the University of Wisconsin was the lecturer in algebra, and I was the lecturer in analysis. I felt afterward that I was not very successful because I had not planned the right kind of course. In the first institute in 1953 the lectures were at the level of advanced graduate courses, and a tradition of excellence--both for lecturers and students--was established. Some of the students in the 1956 institute at Ann Arbor were excellent, but others were very weak. I learned enough from the experience to plan a very much better institute at The University of Kansas in 1957. After 1956 the mathematical level of most of the institutes went down, and many of the courses in them were at the elementary and intermediate level. Although my 1956 course at Ann Arbor was not entirely successful, I did succeed in encouraging at least three of my students (Benjamin A. Fusaro, Elsie C. Muller, and James M. Van Buskirk) to go back to graduate school; they obtained Ph.D. degrees and entered the teaching profession. Finally, several of the participants in the Michigan institute sent their graduate students to The University of Kansas afterwards.

The NSF summer institute program had been successful, and by 1957 it was being expanded. When I visited the National Science Foundation on May 21, 1956, I was encouraged by Dr. Leon Cohen and Dr. Palmquist to apply for a summer institute for 1957. I had met Max Beberman at the meeting of the National Council of Teachers of Mathematics in Milwaukee on April 13-14, 1956, and my plans for the 1957 institute were developed with his help and with his offer to participate in the institute itself. I planned a combined institute for both high school and college teachers. Professor Beberman had developed new courses for the high school grades, and he had written experimental textbooks for them. Many of the teachers were afraid of these new courses and they insisted that the students in their schools could not learn them. Professor Beberman regularly carried on his teacher training program at the University of Illinois with the help of demonstration classes in the University High School, and he insisted on a demonstration class to accompany his course in our 1957 institute. We succeeded in obtaining funds from NSF to pay the operating costs of the institute and to provide stipends for the teachers and for the high school students in the demonstration class. We did not have very much competition in 1957, and we obtained a demonstration class of really exceptional high school students from all over the United States. Professor Beberman spent about two weeks in Lawrence that summer, and David A. Page and Gertrude Hendrix, members of the UICSM staff at the University of Illinois, taught the course for teachers and the demonstration class for the remainder of the summer. There were special courses for college teachers as well as Max Beberman's special course for high school teachers.

NSF summer institutes became a standard part of the Department's summer program. For several years these summer institutes included a demonstration class of high school students that accompanied the high school teachers course. Mrs. Marjorie French, supervisor of mathematics in the Topeka high schools, had been a participant in the 1957 institute; afterward she taught the teachers course and the demonstration class several times. The Department operated one academic-year institute for college teachers. The institutes were beset by one continuing difficulty throughout their history: many of the teachers needed courses that were normally offered at the freshman-sophomore level, but the Department was forced to recommend to the Graduate School that the teachers receive graduate credit for taking them. The teachers needed elementary courses but graduate degrees in order to obtain recognition from their local school boards, and the Department had only its standard M.A. and Ph.D. degrees to offer. The supervision of master's theses for participants in the academic-year institute became a major problem for the Department, and many participants were not able to qualify for the M.A. degree.

I was the director of the first several institutes and several of the later ones, and Professor Bradt was the director of other institutes. The following regular members of the staff taught in the department's institutes: R. N. Bradt, Charles J. Himmelberg, Ronald Jacobowitz, John B. Johnston, Paul J. McCarthy, Joe L. Mott, William C. Nemitz, G. B. Price, Robert Schatten, William R. Scott, Lee M. Sonneborn, George Springer, Donald R. Truax, Fred S. Van Vleck, and John T. White. The following, not regular members of the Department's staff, also served as instructors and visiting lecturers in the summer institutes; some gave a few lectures, some taught courses for one or two weeks, and some taught full courses: Roger T. Douglass, Max Beberman, David A. Page, Gertrude Hendrix, E. J. McShane, Marjorie L. French, and Rex Harvey.

The NSF summer institutes made an important contribution to the development of the Department's program. The institutes for high school teachers (one was held each year from 1957 through 1968) improved the teaching of high school mathematics, and as a result the Department received freshmen who were much better prepared in mathematics. Before 1955 the Department received no freshmen who were prepared to begin the study of mathematics with calculus and analytic geometry; after 1960 some 25 or 30 percent of the freshmen who enrolled in mathematics enrolled in calculus and analytic geometry as their first course. The institutes for college teachers (one was held each year from 1957 through 1965) improved the college teachers and made them alumni of the Department; as a result, they not only graduated seniors with much better preparations in mathematics, but also they encouraged their students to attend The University of Kansas for graduate work. These efforts--MAA visiting lecturer, lecturer in the 1956 Michigan institute, and a long series of summer institutes--raised the level of the Department's students, both undergraduate and graduate. These same efforts, coupled with a recruiting campaign directed at individual students who had been recommended by their departments, finally provided an adequate supply of graduate students and assistant instructors.

The development and perfection of the electronic digital computing machine were hastened by World War II and the cold war that followed. In June 1945, I saw the Aiken Mark I computing machine at Harvard University; it was a mechanical machine, driven by a two and one-half horsepower electric motor. Later, at the Institute for Advanced Study, I saw the electronic computing machine that was built there by von Neumann. In the early 1950's electronic computing machines became available commercially, and their introduction into universities and the establishment of university computation centers followed rapidly. Professor Robert R. Sokal, Professor of Systematics and Population Biology, and Professor Charles F. Weinaug, Professor of Petroleum Engineering, were among the first members of the University faculty who found the electronic data processing machines essential for their work; very early, they obtained access to machines outside the university. I was well aware of developments in numerical analysis and scientific computing, and I arranged for the Department to offer two courses in numerical analysis. The following courses were listed in the University catalog for the first time in 1955-1956:

> 181. Numerical Analysis I. (2) Taylor series and remainder. Solution of non-linear algebraic equations; factorization of polynomials. Linear equations and matrices. Introduction to numerical solution of differential equations. Prerequisite, course 145 or 151. Luke.
>
> 182. Numerical Analysis II. (2) Finite and divided differences. Numerical interpolation, integration, and differentiation; inverse interpolation. Table making; smoothing of data. Prerequisite, course 181. Luke.

The Department did not have a specialist in numerical analysis, and I arranged for these courses to be taught by Yudell L. Luke, a mathematician at Midwest Research Institute in Kansas City. Luke drove to Lawrence and taught each of the courses in a single two-hour session on Saturday mornings.

By the year 1955-1956 there was much discussion of the need for a computing machine on the campus; since funds were scarce, those interested proposed the acquisition of a small machine that was built on the West Coast. The diary that I kept as a visiting lecturer contains the following report on a part of my discussions with Dr. Leon Cohen at the National Science Foundation on May 21, 1956:

Then we talked about computing machines, and he told me that the Foundation was prepared to pay two-thirds of the cost of machines and a part of the salaries of personnel for projects for a period of three years. The Foundation had established an Ad Hoc Panel to advise it on computing machines, and this Panel would have a meeting on June 13 to consider the proposals that had been submitted. If a proposal is to be submitted, it is desirable to send it in quickly.

My records show that a proposal was submitted to the National Science Foundation on June 4, 1956; a modified form of this proposal was submitted on October 8, 1956; and supplementary budget information was submitted on November 5, 1956. Chancellor Murphy, either encouraged by the prospects of obtaining funds from the National Science Foundation or persuaded by IBM salesmanship, had abandoned the idea of obtaining the small machine from the West Coast; instead, he had ordered the following IBM 650 installation in September 1956, and had signed a contract calling for delivery of the equipment not later than April 1957 (this statement is contained in the supplementary budget information dated November 5, 1956):

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|---|---|
| IBM 024 | Key Punch |
| IBM 077 | Collator |
| IBM 082 | Sorter |
| IBM 402 | Accounting Machine |
| IBM 514 | Reproducer |
| IBM 552 | Interpreter |
| IBM 533 | Card Reader |
| IBM 650 | Console Unit |
| IBM 655 | Power Unit |

(The records indicate that the 024 key punch was replaced by an IBM 026 key punch before the equipment was installed.)

Chancellor Murphy appointed an Advisory Committee for the Computation Center, and he made me chairman. As a result of an invitation from John W. Carr III, I attended a meeting of IBM 650-users held at the University of Michigan on

November 30-December 1, 1956; one of the problems discussed at this meeting was the standardization of the wiring of boards for the IBM 650 equipment. It was decided that our IBM 650 would be installed in room 8C of Strong Hall, and that room 8B would be used for staff offices. Window air conditioning units were installed, and hoods with fans were built to exhaust the heat through window openings. A plastic tile floor was installed, and the heavy units were rolled in before the glue under the tiles had dried sufficiently--such was the haste to complete the installation. On the advice of Professor Maude Ellsworth in the Art Department, I had the walls of the room painted "Florentine orange" to provide relief from the dark gray of the IBM equipment. By June 1, 1957, the installation was complete and ready to operate. Chancellor Murphy had provided a budget of $40,000 for the Computation Center's equipment and personnel for the fiscal year which began on July 1, 1957.

A "short course" was needed to help faculty and students begin their use of the Computation Center. I had arranged for Mr. Peter C. Patton to begin graduate work in the Department in September 1957; he had learned about computing machines at Harvard University, where he had completed the requirements for his bachelor's degree in January 1957. Mr. Patton was working for Boeing in Wichita (which was also his home) until it was time for him to begin his graduate work in the University. I proposed to Boeing that it lend Mr. Patton to us so that he could be acting director of our Computation Center during the months of June and July. Mr. Patton and those in Boeing with whom he talked made the following counter proposal: that Mr. Patton and Mr. William R. Bayless (Mr. Patton's supervisor) spend the first week of June at The University of Kansas and give a training course on the operation of the IBM 650 during this time; and that Mr. Patton spend each Monday (and perhaps each entire weekend in addition) in Lawrence during June and July. Chancellor Murphy approved these arrangements;

announcements of the "Training Program for the IBM 650" were widely distributed throughout the University, and eighty-two enrollments were obtained for the Computation Center's first short course. Mr. William R. Bayless and Mr. Peter C. Patton came as planned, and Mr. Patton taught the three-day course on June 4, 5, and 6, 1957, in room 9 Strong Hall. The records show that "about eighty people enrolled for this course, seventy started it, fifty finished it, and about thirty finally demonstrated ability to operate the machine".

During the winter of 1956-1957 I made a search for a Director for the Computation Center. In a letter dated December 14, 1956, Dr. Herman H. Goldstine at the Institute for Advanced Study suggested Dr. Urs W. Hochstrasser at the National Bureau of Standards in Washington. Professor Aronszajn lent assistance to our efforts to obtain him; the Directorship was offered to Hochstrasser and he accepted. He had received an M.A. degree from the Swiss Federal Institute of Technology in 1948 and a Ph.D. degree there in 1954; his Ph.D. dissertation was written under the supervision of Professor Eduard L. Stiefel. He had been an assistant at the Swiss Federal Institute of Technology during 1950-1951, and he had held a position (part time) as an assistant professor at American University from 1955 to 1957. At The University of Kansas, Professor Hochstrasser was Director of the Computation Center and Associate Professor of Mathematics. Peter C. Patton and William D. Lansdown supervised the Computation Center during the summer of 1957, but Professor Hochstrasser took up his duties permanently at The University of Kansas at the end of the summer; he was in charge of the Computation Center and also the Department's courses in numerical analysis and programming. With his help, the following new course was established; it appears for the first time in the University catalog for 1957-1958:

Mathematics 186. Programming for a Digital Computer. (3) Components of a general purposes digital computer; terminology, single and multiple address machines, different number systems, introduction to elementary matrix calculus, flow diagrams, preparation of simple codes, use of subroutines, scaled operations, code checking techniques, interpretative routines, automatic coding. Two lecture hours and two laboratory hours per week. Prerequisite, course 145. Staff.

Professor Hochstrasser remained at The University of Kansas for only one year. The Swiss Embassy in Washington requested that The University of Kansas give him leave so that he could serve as the Science Attaché in the Embassy. The University was reluctant to grant him leave, but the Swiss Ambassador in Washington was insistent. After Professor Hochstrasser had been on leave for two years, he requested leave for a third year; since the University never grants leave for more than two years, Hochstrasser severed his connection with the University and never returned.

Professor R. N. Bradt became acting director of the Computation Center when Professor Hochstrasser left in 1958. Professor Bradt administered the Computation Center but he did not become a computer scientist; he had assistants who operated the machines and carried on the work. Professor Bradt was acting director until Professor R. G. Hetherington became director in September 1961.

A second proposal, entitled "Support of the University of Kansas Computation Center", was submitted to the National Science Foundation on October 2, 1958. This proposal states that an earlier grant from MSF had enabled the Computation Center to improve its IBM 650 installation by adding an IBM 653 unit containing index accumulators and built-in floating point instructions, and by installing an IBM 407 tabulator with scientific symbols in exchange for the original IBM 402 tabulator. The University continued to obtain small grants from the National Science Foundation for the support of its Computation Center.

The location of the Computation Center in rooms 8B and 8C in Strong Hall was planned to be temporary from the beginning. A letter dated November 1, 1956, and addressed to me by Mr. R. Keith Lawton, at that time administrative assistant to the chancellor, described a permanent location.

> The permanent location of this computing center is to be in the new Business and Economics Building, which should be ready for occupancy in September of 1959. At present time plans call for approximately 1400 square feet of space to be provided to serve this operation. A breakdown of it is as follows:
>
> | | |
> |---|---|
> | IBM Equipment Room | 672 square feet |
> | Research Booth Area | 336 |
> | Storage | 100 |
> | Two Offices | 240 |
> | | 1348 square feet |
>
> At an estimated cost of $18 per square foot the total cost of the facility is, then, $25,000.

The "new Business and Economics Building" to which Mr. Lawton referred is the present Summerfield Hall; it was completed on schedule, and the records show that the Computation Center and its IBM 650 computing installation moved in August 1959 into the rooms on the first floor that had been designed for them. From August 1959 to the present day the Computation Center has been located on the first floor of Summerfield Hall; the legislature has now appropriated funds to build a special building for the Computation Center.

The Department of Mathematics was offering Mathematics 181 and 182, Numerical Analysis I and II, and Mathematics 186, Programming for a Digital Computer. From the point of view of the rest of the University, these were advanced courses since each of them had a course in differential equations as a prerequisite. By the spring of 1958 I felt that a more elementary course was needed for the benefit of students in the social and biological sciences and in the School of Business who needed to learn data processing but who could not satisfy the prerequisite of a course in differential equations. Professor Hochstrasser and the Department of Mathematics recommended the establishment of two new courses; they were Mathematics 86, Elementary Coding for a Digital Computer, and Mathematics 87, Laboratory in Data Processing, each for two semester hours of credit. These two new courses appear in the University catalog for 1958-1959 but not in later catalogs; the following new course appears in the University catalog for 1959-1960 and later years:

> Mathematics 16. Elementary Coding for a Digital Computer (3) Description of peripheral equipment, board wiring, structure of the IBM 650 computer. Operating procedures, flow charts, machine language, coding problems in science and engineering, simple statistical applications, assembly routines, use of selected library programs. Two hours lecture and two hours laboratory per week. Prerequisite, course 2a, 2c, or 2d.

For approximately the next ten years the Department of Mathematics offered Mathematics 16, 181, 182, and 186 as its contribution to data processing, numerical analysis, and computer science.

Professor Bradt served as Director of the Computation Center from 1958 to 1961. The Computation Center grew slowly at first, with its operations based on the IBM 650 installation. The University's data processing for the Business Office and Registrar's Office was carried on by a separate installation located in Bailey Hall and supervised by Mr. Jerry Davis. In September 1961, Professor Richard G. Hetherington became Director of the Computation Center; he had just received his Ph.D. degree from the University of Wisconsin for a dissertation written under the supervision of Professor Preston G. Hammer. Professor Hetherington held an appointment also as an Assistant Professor of Mathematics, and he was in charge of the Department's courses in programming and numerical analysis. His special field of research was numerical analysis.

The use of the Computation Center grew, and the manufacturers developed newer and better machines; in January 1961, the University ordered an IBM 1620 magnetic tape system. As frequently happened, delivery of the new system was slow; the Computation Center's IBM 1620 system was not installed until September 1962. It was located in the same suite in Summerfield Hall that had been designed originally for the IBM 650. With newer and more adequate computing equipment and with an expanded staff, the Computation Center prospered. Almost immediately after the IBM 1620 was installed, therefore, the Computation Center and its Advisory Committee were obliged to plan the next expansion and to place an order for the next system of machines. A decision was made to order IBM equipment again, partly because the International Business Machines Corporation was a leading manufacturer of computing equipment and partly because IBM gave universities favorable educational discounts as inducements to establish computation centers, to train students in the use of computing machines, and to promote IBM equipment.

The new generation of computing equipment ordered in 1963 was an IBM 7040-1401 computer system. It was much larger than the IBM 1620 system, and it could not possibly be installed in the area of Summerfield Hall that had housed the smaller system. Since the enrollment of the University was increasing rapidly and space of all kinds was scarce, the location of an area in which the IBM 7040-1401 system could be installed became a critical problem. As chairman of the Advisory Committee for the Computation Center, I had the responsibility for making a recommendation. Mr. Lawton and I inspected several areas that had been proposed. A large addition to Watson Library was being built on the east end, but Mr. Lawton and I could see no possibility of locating the Computation Center there. Learned Hall had been built, and the School of

Engineering was anxious to have the Computation Center located in a large area under the west end of the building. When Mr. Lawton and I inspected the area, we found that it was underground, had a dirt floor, and was associated with a wind tunnel and heavy equipment for testing the strength of beams. It was completely unsuitable for delicate electronic equipment that required a dust-free installation with carefully controlled temperature and humidity. In the end I recommended to Dean Surface that the Computation Center be located in the rooms at the east end of the first floor of Summerfield Hall. These rooms had been designed especially for a Secretarial Training Program, managed by Miss Loda Newcomb and associated with the School of Business. Dean Surface approved my recommendation; Miss Newcomb was moved out of quarters that must have seemed ideal to her (a year or two later her Secretarial Training Program was abolished); and the vacated area was remodeled for the Computation Center. The large room at the northeast corner of the building became the machine room; it was provided with a raised floor and a large amount of special air conditioning equipment. The IBM 7040-1401 computer system was installed in the remodeled area of Summerfield Hall in July 1964.

But the installation of the new system did not satisfy the University's needs for computing facilities; it only increased them. About this time the Computation Center received a large grant from the National Science Foundation and a large grant from the National Institutes of Health to increase the use of the Computation Center. The Computation Center--whether measured by the number of jobs finished, by the number of hours of machine operation, by the size of the operating staff, or by the size of the budget--grew at an enormous rate; the University had great difficulty in providing the funds required to pay for the machines, the supplies, and the salaries of the staff.

Almost as soon as the IBM 7040-1401 computer system was installed, the Advisory Committee for the Computation Center began planning the next expansion and the selection of the next generation of computing equipment. The machines of many vendors were investigated, but those of IBM, Control Data, and General Electric were the three that were considered seriously. The proposal of IBM was disappointing; computing capability would grow slowly through a series of machine changes that would involve many conversion problems. Control Data offered a large machine that was very fast on problems of scientific computing, but that lacked some features considered highly desirable. General Electric made a surprisingly good offer on a big machine that had all of the desirable features of time sharing, multiprogramming, remote access, and large expansion capabilities without burdensome conversion problems of reprogramming. Accordingly, a contract for a General Electric 625 computer system was signed in June 1965.

The competition among the leading manufacturers of computing machines was so severe that many of them contracted to deliver machines that were in the planning stage but not fully developed, and the General Electric Company had real difficulty in fulfilling the contract it had signed in June 1965. The contract called for installation of the GE 625 in February 1966, but this installation date slipped to July and then to November 1966. In the end, it was May 1967 before the General Electric 625/Data Net 30 computer system was accepted and the last of the IBM 7040-1401 computer system was discontinued. Installations of General Electric computing equipment are very rare in universities, but they have been notably successful at Dartmouth College (where Professor Kemeny, with General Electric equipment, made important contributions to computing) and at The University of Kansas. The GE 625 computing system at The University of Kansas was upgraded to a GE 635 system with ease (one of the anticipated advantages of the General Electric equipment) during the academic year 1968-1969. Now in 1976, contracts have been signed for a new installation with Honeywell and IBM equipment.

In the spring of 1968, The University of Kansas began the establishment of a Department of Computer Science. Professor Earl J. Schweppe, then at the University of Maryland, was appointed Professor of Computer Science and chairman of the Committee on Computer Science in the spring of 1968; he became Chairman of the Department of Computer Science when it was established a little later. In 1969 Professor R. G. Hetherington resigned as Director of the Computation Center and accepted a joint appointment in the Departments of Mathematics and Computer Science. Mr. Paul J. Wolfe from the University of Iowa became Director of the Computation Center in July 1969.

Although I put a great deal of effort into the development of the Computation Center of The University of Kansas, it would seem that this effort contributed very little to the Department of Mathematics. Except for the two years from 1959 to 1961 when I was away from the campus, I was Chairman of the Advisory Committee for the Computation Center from the time of its first appointment in 1956 until after the General Electric 625 computer system was ordered in 1965. At that time Dean Argersinger became the Chairman of the Advisory Committee, but I continued as a member until it was reorganized in the fall of 1969. As Chairman of the Advisory Committee, I spent a great deal of time and effort on committee meetings and on routine administrative supervision of the Computation Center; on the search for staff and the preparation of annual budgets; on the writing of proposals to the National Science Foundation and the National Institutes of Health in an effort to secure funds to support the Computation Center, and the writing of annual reports after grants had been received, on studies leading to the selection of, and orders for, new individual items of equipment and whole computing systems; and on the search for, location, and remodeling of space for the Computation Center. The Department of Mathematics offered Mathematics 16, 181, 182, and 186, but it quickly gave up Mathematics 16 and 186 when the Department of Computer Science was formed in 1968. Professor Hetherington maintained an interest in numerical analysis, but only one member of the staff ever developed an interest in computer science or in any of the activities of the Computation Center. Professor John B. Johnston became interested in computer science in 1962-1963 as a result of his collaboration with Professor F. S. Van Vleck and myself on the writing of a book entitled *An Introduction to Mathematics*, but Johnston left the University for a position at the General Electric Company in Schenectady shortly thereafter because there was no one in Lawrence who was interested in computer science. Although my efforts on behalf of the Computation Center certainly gained some good will, especially from Chancellor Murphy, for myself and for the Department of Mathematics, they led to no permanent developments within the Department itself. Although the development of computing machines and of computer science had a major influence on the evolution of the mathematical sciences and the creation of jobs for mathematicians between 1950 and 1970, the members of the Department of Mathematics made no positive response to these developments on our campus. I was genuinely disappointed when in 1968 the Department declined to participate in the development of computer science at the University and insisted on the formation of a separate Department of Computer Science. By 1971 funds for the support of graduate study and of research had largely disappeared, and jobs and positions of all kinds had become exceedingly scarce. Some of the national leaders among the mathematicians fear that we may have created serious competitors for ourselves--that departments of computer science may take over much of the work formerly performed by departments of mathematics. Time will tell.

I would now like to return to the events of the year 1957. The Computation Center was established in that year, and by completing its history I have interrupted the chronological account of events in the Department and in the University. The year 1957 was the year in which the Mitchell bequest became available, and the year in which the continuing program of Mitchell scholarships was initiated. The story begins much earlier with Professor Mitchell's retirement dinner on January 31, 1941; a newspaper account of the dinner [Mitchell 11] states that "in honor of his service as head of the mathematics department a gift of a $100 scholarship in the department is being established for the years '41 and '42". The 1941 commencement program (page 19) states that the U. G. Mitchell Honor Scholarship for 1941-1942 was awarded to Miss Doris Nieweg of Leavenworth. The full history of the Mitchell scholarships before 1957 is best summarized in a talk entitled "The Mitchells and The U. G. Mitchell Honor Scholarships" which Dean Emeritus E. B. Stouffer gave at a meeting of the Department of Mathematics on October 16, 1956 [S, ch. 5, sec 1].

The Mitchell bequest, in my opinion, is one of the most magnificent gifts ever received by The University of Kansas. Exact figures are not available, but it certainly amounted to more than $50,000 when it was received by the Endowment Association in 1956 (its receipt was delayed by an effort in court to nullify the bequest). As a result of wise investment, it has grown until its value is in the $125,000 to $150,000 range, and it produces $6,000 to $7,000 annually to support scholarships in the Department of Mathematics. The University of Kansas has received larger gifts, but probably not from one whose annual salary in all likelihood never reached $7,500. The Mitchell bequest has never received the recognition it deserves.

As chairman of the Department of Mathematics, I had the responsibility for drawing up the plans for the use of the Mitchell bequest. The terms of Mrs. Mitchell's will required that the U. G. Mitchell Honor Scholarship for an entering freshman be continued. The plans drawn up by Mr. Youngberg and myself, and approved by Chancellor Murphy, specified that the additional funds available be used to support U. G. Mitchell Honor Scholarships in Mathematics for students majoring in mathematics in the College of Liberal Arts and Sciences and in the School of Education. All of the funds (through 1970) were used for undergraduates in mathematics and in education, and almost all of the money has been awarded in the form of scholarships. We attempted in this way to carry out what we believed to be the wishes of Professor and Mrs. Mitchell.

U. G. Mitchell Honor Scholarships and Honor Scholarships in Mathematics for the year 1957-1958 were awarded in the spring of 1957. During the 1950's there were strenuous efforts to develop The University of Kansas into a scholarly university of the first rank. Chancellor Murphy and Robert Vosper expanded the library; Dean Waggoner established his special program for gifted students; and Chancellor Murphy established the first distinguished professorships. It seemed to me that the establishment of the Mitchell scholarships called for recognition of the Department's scholars and scholarly activities.

Recognition took the form of an honors dinner, and the first Honors Dinner of the Department of Mathematics was held on April 25, 1958. All of those who held scholarships during 1957-1958 and all of those who had been awarded scholarships for 1958-1959 were invited to attend the dinner as guests of the Department; their names were listed in the Honors Dinner program. This program also listed contracts and grants awarded to members of the staff, and promotions, fellowships, and other indications of merit received by members of the Department's faculty. Professor Hochstrasser was a member of the Department during 1957-1958, and through him we arranged to have Professor Stiefel from Zürich as a visitor to the University on April 25, 1958. I invited Professor Stiefel to be the speaker at the Honors Dinner on that day. He chose "The History of Pi" as the title of his talk, and although Professor W. R. Scott objected, most people thought Stiefel gave the perfect after-dinner talk. He had the light touch: he was witty and amusing. He was informative: he traced the history of $\pi$ from Biblical times (when its value was taken as 3) to the year 1958. He displayed a pamphlet in which the value of $\pi$ was printed out to 10,000 decimal places, the calculation having been made on an electronic computing machine. This value of $\pi$ is a striking illustration of the change in the world's ability to compute. A hundred years earlier an Englishman, William Shanks, spent twenty years of his life computing $\pi$ to 707 decimal places. In 1949 the computing machine known as the ENIAC computed $\pi$ to more than 2,000 decimal places in seventy hours. Later, another machine computed $\pi$ to more than 3,000 decimal places in thirteen minutes. A still later calculation of $\pi$ to 10,000 decimal places was found in 1957 to have an error in the 7,480th decimal place. And, sad to relate, these modern calculations showed that William Shanks had made a mistake in the 528th decimal place.

Chancellor Murphy and Dean Waggoner attended the first Honors Dinner. Dean Waggoner thought this first one was so perfect that he said to me at its conclusion that I should never try to have another. Nevertheless, the Honors Dinner became an annual event which was continued to the present day. I always invited the chancellor and the deans and members of the administration with whom I worked, and many of them and their wives came each year; Mr. and Mrs. Raymond Nichols came almost every year. Chancellor Murphy came in 1958 and 1959. When I would invite him, he would say, "Now I don't have to make a speech, do I?" I would assure him that he did not, but, seated at the head table, he never failed to make remarks at the dinner when the opportunity was offered to him.

I have always felt that the Honors Dinners were nice occasions, not only for the Department's students and their parents, but also for the Department itself. It was the best way that I ever found for the Department to call attention publicly to its activities and its accomplishments.

The Department of Mathematics has received numerous bequests to support memorial scholarships. These bequests and scholarships are described as follows in the Honors Dinner Program for 1970; in each case a sholarship is awarded on merit and its stipend is determined by need.

THE CHARLES H. ASHTON SCHOLARSHIPS

This scholarship fund was established in 1947 in memory of Professor Ashton by a gift from his family and friends. The fund was increased in 1970 by a significant gift from members of Professor Ashton's family. Professor Ashton was a member of the Department of Mathematics and its Chairman for many years.

THE CHARLES HOBBS SCHOLARSHIPS

This scholarship fund was established in 1954 in memory of Mr. Hobbs by a gift from his sister, Miss Helen Hobbs. Mr. Hobbs was a graduate of the University and a former Commissioner of Insurance for the State of Kansas.

THE MAY LANDIS SCHOLARSHIPS

These scholarships were established in 1958 in memory of Miss May Landis by a bequest from her brother, Mr. Paul Landis. The fund to support these scholarships was greatly increased in 1963 by a bequest from her sister, Miss Maude Landis. Miss May Landis was a high school mathematics teacher in Leavenworth and Kansas City.

THE U. G. MITCHELL SCHOLARSHIPS

These scholarships were established in 1954 in memory of Professor U. G. Mitchell by a bequest from his wife. Professor Mitchell was a member of the Department of Mathematics and its Chairman for many years.

THE ROLLIN STERLING WADE MEMORIAL SCHOLARSHIP

This scholarship was established in 1964 in memory of Rollin Sterling Wade by a gift from his parents. Mr. and Mrs. Wade are graduates of the University and their son was a student at the University.

The announcement of the recipient of the Florence Black Award in Teaching is made each year at the Honors Dinner. Professor Florence Black retired in June 1960; she was a member of the Department's teaching staff from 1918 to 1960. Mr. Paul S. Endacott, a distinguished alumnus of the University, had known Professor Black when he was a student in the University; in a letter dated December 13, 1960, Mr. and Mrs. Endacott sent the Endowment Association a check for $1,000 to establish the Florence Black Teaching Fund. The income from this fund is used to support an award of $50 made each year to an outstanding teacher among the Department's first-year assistant instructors. The first award of the Florence Black Award in Teaching, for the year 1960-1961, was made to Martha L. Anderson; it was announced at the Honors Dinner in the spring of 1961. The recipient of the award has been announced at the Honors Dinner each spring since that time.

In 1965, the three children of Henry Byron Newson--Mrs. Hugh M. Beshers, Miss Josephine Newson, and Professor Henry W. Newson--provided a fund to endow the Henry Byron Newson Lectureship. The first lecture under the sponsorship of this fund was entitled "The New Logic"; it was given at the Honors Dinner on May 7, 1969, by Professor Stephen C. Kleene, Cyrus C. MacDuffee Professor of Mathematics in the University of Wisconsin.

In 1965 Professor and Mrs. Guy W. Smith established the Guy W. and Linda P. Smith Fund with a gift (to the Endowment Association) of $4,000 to support a lectureship. The first lecture sponsored by this fund was entitled "The Mathematics Scene"; it was given by Professor Paul A. Smith of Columbia University at the Honors Dinner on Wednesday, April 29, 1970, in the Ramada Inn in Lawrence. (This Honors Dinner had been scheduled as usual in the Kansas Room of the Kansas Memorial Union, but I was forced to move it to the Ramada Inn because of the fire that burned the roof off of the Union ballroom on the night of April 20, 1970.) Professor Smith also gave a lecture on differential topology on the day following his lecture at the Honors Dinner. Professor Paul A. Smith is the most distinguished mathematician who has obtained a degree from The University of Kansas. He received his B.S. degree from Dartmouth College in 1921, his M.S. degree from The University of Kansas in 1923, and his Ph.D. degree from Princeton University in 1926. His master's thesis was supervised by Professor Solomon Lefschetz, then a member of the faculty of The University of Kansas. Professor Smith held a National Research Council Fellowship at Harvard University during 1926-1927 (I met him for the first time that year at Harvard), and he was a member of the faculty of Columbia University from 1927 to about 1970. He was Treasurer of the American Mathematical Society from 1937 to 1939 and Chairman of the Division of Mathematics of the National Research Council from 1956 to 1958. He is a member of the National Academy of Sciences. In recent years his earlier hobby of mountain climbing has been replaced by instrument making; he makes lutes, the Elizabethan musical instrument, especially for his wife.

All Honors Dinners were occasions for the recognition of the Department's scholars and scholarly activities and for honoring all of those who had performed outstanding services for the Department and for the University. The Honors Dinner in 1964 was the occasion for honoring especially Professor Wealthy Babcock; it was held at 6:30 p.m. on Monday, April 20, 1964, in the Big Eight Room of the Kansas Union. Many members of the faculty outside the Department of Mathematics attended the dinner since it had been announced as one honoring especially Professor Babcock; all in all, about two hundred students, parents, members of the faculty, and wives attended. This Honors Dinner had the largest attendance of any held between 1958 and 1976. The speaker at the 1964 Honors Dinner was Dr. Joseph C. Shipman, scholarly librarian of the Linda Hall Library in Kansas

City; his talk was entitled "Johannes Petreius, Printer of Mathematical Works in 16th Century Nuremberg". The Honors Dinner program contained a page which described the services of Professor Babcock; it read in part:

> Professor Babcock was appointed Librarian of the Mathematics Library in April, 1934. The foundations of an important mathematics library were laid in the early years of the University. Through the difficult years of the great depression in the 1930's, and war years of the 1940's, and the post-war period in the 1950's, Professor Babcock's efforts have succeeded in maintaining and building the Department's excellent library of the present day.

As the high point of the Honors Dinner, I announced that the Department, with the approval of the University, had named its library The Wealthy Babcock Mathematics Library.

Professor Babcock retired from active teaching in June 1966. She had rendered distinguished service as a teacher, as the Department's Librarian (she continued as the Department's librarian until she retired in 1966), and as a member of various committees that awarded the University's scholarships. The 1964 Honors Dinner had recognized her services to the Department of Mathematics; in June 1966, the University honored her for her services on scholarship committees by dedicating a plaque, mounted on the wall of the Office of Student Financial Aid in room 26 Strong Hall; it is inscribed as follows:

FOR OUTSTANDING SERVICE

Presented to

Dr. Wealthy Babcock

on June 6, 1966, in recognition and

appreciation of the many years of dedicated

service which she has given to the scholarship programs of the University of Kansas.

| | |
|---|---|
| Robert Billings<br>Director, Office of Student Financial Aid | W. Clarke Wescoe<br>Chancellor, University of Kansas |

Now let me return once more to the eventful year 1957. The Department had already initiated its honors program, with special courses, but efforts were made during 1957 to establish this program in permanent and final form. The year 1957 was my last year as Editor of the *Bulletin of the American Mathematical Society*, but it was my first year as President of the Mathematical Association of America; at the end of 1956 I had been elected President of the MAA for the two years 1957 and 1958. As I have just recounted, 1957 was the year the first Mitchell scholarships were awarded. Also, 1957 was the year the Computation Center was established: the IBM 650 computer was installed in room 8C Strong Hall in May 1957, and operations began with the "Training Program for the IBM 650" taught by Mr. Peter C. Patton on June 4, 5, and 6 and with the appointment of Professor Hochstrasser as Director of the Computation Center. Next, the Department conducted its first National Science Foundation summer institutes for high school and college teachers of mathematics during the summer of 1957. But there was still one other event of tremendous importance that occurred in the year 1957.

On October 4, 1957, the Soviet Union launched Sputnik I; it was a sphere that weighed 184 pounds and circled the earth about every one and one-half hours in an elliptical orbit which varied in altitude from about 140 miles to 560 miles above the earth. The United States--startled, shocked, and alarmed--feared for its prestige and for its security. But while the United States was still trying to recover from the initial blow, the Soviet Union launched Sputnik II on November 3, 1957. The second Soviet space craft weighed 1,120 pounds, carried a live dog, Laika, as the world's first space passenger, and orbited the earth about every 103.7 minutes at altitudes varying from about 160 miles to 1,062 miles.

There was immediate and widespread discussion of, and concern over, the startling achievements of the Russians. The *Alumni Magazine* for November 1957 carried a series of four articles on the meaning of Sputnik [*The Graduate Magazine* 113]; these accurately describe the nation's reactions to its loss of the space race to Russia. The nation's reactions were, first, that the United States was being surpassed and its prestige and security threatened, and second, that the United States must improve its educational system and redouble its efforts on research and development. Richard W. Porter, himself involved in the space program of the United States, wrote as follows [*The Graduate Magazine* 113, p. 10]:

> The importance of the "Sputnik", therefore, is not so much in the fact that it has come into being several months before instead of several months after, the equivalent U. S. test satellite, but rather in the fact that its erection was accomplished in a manner indicative of broad skill and experience, and that this skill and experience have been acquired in a fantastically short period of time. The trend is clear. Although we have not yet been completely surpassed, *we are being surpassed*, make no mistake about it.
>
> I believe that if we want to reverse this trend, we must start by overhauling a large part of our educational system, beginning with the elementary grades and extending up through the most advanced work in our universities and institutes. Technical curricula will have to be strengthened and foreign languages added, beginning at an early year, so that the exchange of technical information can flow both ways instead of only one way at present. Perhaps classes will have to run ten or eleven months of the year, as they now do in Russia, instead of eight or nine months as is now common in the U.S.A. The economic status and prestige of the teachers must be enhanced, incentives provided to make the student do his best, and appropriate opportunities and rewards must be offered to those who can qualify as exceptional students. Better buildings and equipment must be provided.
>
> Of course, it will be expensive--but think of the cost of the alternative. We no longer have a choice! Surely all U. S.

> engineers and scientists will understand the meaning of this message our Russian colleagues have sent us and will really go to work, not just on missiles and satellites--for the next challenge may well come in some unrelated field--but in all fields and disciplines, as if they were working for the very future of their families and their nation. For indeed they are!

The Mathematical Association of America was a member of the American Council on Education, and, as the President of MAA, I attended the annual meeting of ACE in October 1957. At the closing session on October 11, 1957, Chancellor Franklin D. Murphy, the retiring chairman of the American Council on Education, made some remarks that were widely quoted as describing the nation's response to Sputnik. These remarks were published in full in the *Alumni Magazine* as "The Meaning of Sputnik: The Educational Implications" [*The Graduate Magazine* 113, p. 11]:

> What is the significance to America, as newspaper and radio commentators, statesmen and the American people, of a polished man-made metal sphere circling the globe every ninety minutes at 18,000 miles per hour and at a height of 400 miles? Back comes a flood of superficial answers--inter-service rivalry--false economy--Russian technical skill--American scientific lag, etc. These observations, if true, are nothing but the icing on the cake. The real meaning of the satellite is that it provides a dramatic glimpse into the depth and violence of the great scientific revolution in which we are all caught up and which daily alters all aspects of our personal and national lives. The message which this little ball carries to all Americans if they would but stop and listen is that in the last half of the 20th century--in this age of incredible technological change--nothing is as important as the trained and educated mind. This sphere tells not of the desirability but the *urgent necessity* of the highest quality and expanded dimensions of the educational effort. It states more dramatically than ever before that the future of the 20th century lies in the hands of those who have placed education and its siamese twin--research, in the position of first priority.
>
> As Walter Lippmann pointed out as early as 1954, we have reached the stage in history where nothing less than a major break-through to a newer and higher plateau of educational effort will suffice. Break-throughs are not new to the American people. In 1941, we decided that the national interest required an unprecedented change in our military power and we accomplished it. Recently we

> determined the need for a massive break-through in the matter of highways and we are now in the process of cheerfully funding this new effort. Yet in the matter most vital to our individual and collective future we are still trying to decide how much education we can afford. Now the American family and the American public must decide how great an educational effort is needed to achieve this educational break-through--no matter what the most. The urgency of our time requires that the yardstick for education *must be the need not the dollar*. To quote Mr. Lippmann, "There is an enormous margin of luxury in this country against which we can draw for our vital needs."
>
> This then is the message that the satellite is beeping down to those who will listen--the crucial role of the trained and educated mind at this juncture in history. It is trying to say that time is already short and unprecedented effort is needed to reach unprecedented educational goals. We can only hope that we have the national good sense and enlightened leadership to make this effort successfully and in time.

Three events were largely responsible for the great efforts that the United States made in education, science and mathematics, and research and development and for the huge sums of money that the nation appropriated for activities in these areas between 1945 and 1970. The first of these events was World War II and its successful conclusion, and the report entitled *Science: The Endless Frontier* which Vannevar Bush submitted to President Truman in July 1945. This event led to the establishment of the Office of Naval Research, the Office of Scientific Research, the Office of Ordnance Research, and especially to the establishment of the National Science Foundation by Congress in 1950. The second event was the launching of Sputnik I and II by the Russians in October and November, 1957, and I propose to describe now some of the important consequences of this event. The third event came later; it was the following historic pronouncement made by President Kennedy on May 25, 1961: "I believe we should go to the moon . . . before this decade is out." The consequences of this event will be described later.

As a result of Sputnik I and II, many meetings of various kinds were held to discuss problems in education, science, mathematics, and research connected with the crisis. Because I was President of the Mathematical Association of America, I was invited to attend many of these meetings. Warren Weaver and the American Association for the Advancement of Science invited me to attend a meeting held at the Park-Sheraton Hotel in Washington, D. C. in late January 1958. Dael Wolfle interrupted one of the sessions to announce, "Vanguard is in orbit!" Explorer I, the first United States earth satellite to be placed in orbit, and a satellite in the nation's Vanguard program, was launched on January 31, 1958. The Russians ridiculed Explorer I because, they said, it was only the size of a grapefruit. Also I attended a special meeting that was held at the Office of Education in Washington; this meeting considered a broad range of needs of colleges and universities, and I emphasized the need of The University of Kansas for a building for its Department of Mathematics. In the summer of 1958 I attended a formal and very elaborate dinner for four or five hundred scientists held at The Waldorf Astoria Hotel in New York City; President Eisenhower was the guest of honor. He announced that he had decided to ask Congress to appropriate funds to build the Stanford Linear Accelerator; the dinner had been arranged for the sole purpose of promoting this project.

The launchings of Sputnik I and II delivered a serious blow to the nation's prestige and sense of security, and the winter of 1957-1958 was a time of much frantic groping for solutions to problems of education, research, science and technology, and national defense. A meeting in which I became involved illustrates some of the less solidly based and less successful activities that resulted from the frenzied mood of the times. I was startled one day in December 1957 when I received a telephone call which began: "This is Kevin McCann in the White House". I had never heard of Kevin McCann, but a call from the White House demanded attention. I soon discovered that Kevin McCann was calling, not as a member of the White House staff, but as President of

Defiance College, a small college of about six hundred students located in the rather isolated town of Defiance, Ohio, in the northwest part of the state. Mr. McCann asked me to come to Defiance College to participate in a science meeting which he was organizing, and which would be held about the end of the 1957 Christmas holidays. I agreed to participate in the meeting. I learned that Professor Richardson, a professor of science education at Ohio State University and President of the National Science Teachers Association, had agreed to participate also. When the appointed time arrived, President McCann met Professor Richardson and myself at the Indianapolis airport with a small airplane and flew us to Defiance, Ohio. The airplane, borrowed from a local oil company, had a professional pilot and seats for three others.

No one seemed to know what the purposes and objectives of the meeting were. The faculty members from Defiance College and the scientists from the neighborhood who attended the meeting were unhappy and felt that someone was taking advantage of them. Professor Richardson and I felt that President McCann had imposed on us by persuading us to participate in a pointless and futile undertaking. How did I get involved? One of my friends in Washington had found it easy to suggest my name, probably because I was President of the Mathematical Association of America. Who was Kevin McCann? His connection with the White House resulted from the fact that he was a speech writer for President Eisenhower. A further clue is contained in the following sentence which appears under "Acknowledgments" on page 480 of *Crusade in Europe*, published by Dwight D. Eisenhower in 1948 as his memoirs of World War II: "Brigadier General Arthur S. Nevins and Kevin McCann, who rose from private to lieutenant colonel during the war, were indispensable assistants throughout the preparation of the book, once the decision to write it had been made." It seems that Kevin McCann had no special competence in the field of science, and that he had blundered into organizing a meeting on science at Defiance College as a result of the national commotion created by the launchings of Sputnik I and II.

I have explained that, as a result of Sputnik I and II, many meetings of various kinds were held to discuss problems in education, science, mathematics, and research connected with the crisis. A second result of Sputnik I and II was an immediate increase in Congressional appropriations for the National Science Foundation. The increased appropriations made possible a huge expansion of NSF's program of summer institutes. It is related that Russian scientists have said, jokingly, that Sputnik I and II were merely their effort to repay American scientists for U. S. contributions to the support of Russian science through the development of the atomic bomb in 1945. Whether intentional or not, Sputnik I and II certainly were highly effective in providing funds for education and research in science and mathematics in the United States.

In November 1957, President Eisenhower appointed Dr. James R. Killian, Jr., who was President of Massachusetts Institute of Technology at the time, to be Special Assistant to the President. Killian was usually known as the President's Science Adviser. He invited me to come to see him on one of my trips to Washington, and I went. He asked me about the needs of the mathematicians, and I told him about our efforts to establish the Conference Board of the Mathematical Sciences (activities that will be described later). Dr. Killian suggested that I talk to Dr. Harry C. Kelly in the National Science Foundation; I talked to Dr. Kelly, but he refused to have anything to do with efforts to establish CBMS. When I talked with Dr. Killian, he plainly showed the strain of overwork resulting from the critical situation created by Sputnik I and II. Another consequence of Sputnik I and II was the passage by Congress of the National Defense Education Act of 1958. This Act was designed to promote and support the study of science, mathematics, and foreign languages in high schools and in colleges and universities. It provided, among other things, funds for equipment and also three-year fellowships for graduate study. It is significant that the Act used the nation's requirements for national defense to justify the support of science, mathematics, and foreign languages.

The establishment of the School Mathematics Study Group (SMSG) was a result of Sputnik I and II that had great importance for mathematics. The Commission on Mathematics, with Professor A. W. Tucker of Princeton University as chairman, had been appointed in 1955 as a result of a recommendation of the College Entrance Examination Board's Committee on Examinations. By 1958 the Commission on Mathematics had prepared valuable recommendations, but much more was needed. The Physical Science Study Committee (PSSC) had been established at the Massachusetts Institute of Technology in 1956 under the leadership of Professor Jerrold R. Zacharias, and there was pressure on the mathematicians to organize a similar group. The National Science Foundation sponsored a conference of mathematicians in Chicago on February 21, 1958 (I was not invited to attend). This conference, called the Chicago Conference on Research Potential and Training was concerned with the problems of supply and demand of research mathematicians. Those who attended the conference soon decided that the teaching of mathematics in the schools was involved in efforts to overcome the shortage of research mathematicians. The conference passed a resolution [Wooten 1, p. 10] which

> requested that the President of the AMS, after consulting with the Presidents of the Mathematical Association of America (MAA) and the National Council of Teachers of Mathematics (NCTM), appoint a committee of mathematicians whose function it would be to "seek funds from suitable sources and proceed toward a solution of the problem," the problem being the existing state of the school mathematics curriculum.

Mina Rees of Hunter College had already arranged another meeting. It was called the Mathematics Meeting of the National Science Foundation, and it was held at the Massachusetts Institute of Technology in Cambridge, Massachusetts on February 28 and March 1, 1958. Professor William Wooten continues the story as follows [Wooten 1, p. 11]:

> The members of the Cambridge Conference, as it came to be called, were chiefly research mathematicians, including the presidents of both the AMS and the MAA, together with a number of members of the governing boards of both organizations. After hearing from the physicists and a representative of the Commission on Mathematics, the conference engaged in a discussion that terminated in the reaffirmation of the AMS resolution enunciated in Chicago. The following day, March 1, 1958, the conference made specific recommendations as to tasks to which the AMS-appointed committee should address itself. These were: (1) to hold a four- or five-week writing session the next summer to prepare a detailed syllabus for a model secondary-mathematics curriculum beginning with the seventh grade, and (2) to arrange for the preparation and publication of monographs on topics in mathematics of interest and value to secondary school students. The conference further adopted, by unanimous agreement, a resolution designating a small subcommittee to act for the conference until such time as the President of the Society could appoint the suggested committee.

The Council of the American Mathematical Society approved the plans that had been made, and, on April 3, 1958, after consulting MAA President G. Baley Price and NCTM President Harold P. Fawcett, AMS President Richard Brauer appointed a committee of eight mathematicians to carry out the instructions of the Chicago and Cambridge conferences. I was a member of the Committee of Eight. The School Mathematics Study Group was established at Yale University, and Professor E. G. Begle of its Department of Mathematics became the Director of SMSG. The National Science Foundation made a grant of $100,000 to SMSG on May 7, 1958, for the purpose of devising "a practical program which will improve the general level of instruction in mathematics in elementary and secondary schools". Immediately after NSF made this grant, the Committee of Eight appointed an Advisory Committee (later called the Advisory Board) of twenty-six members. I was a member of the original SMSG Advisory Committee, and I remained a member of the Advisory Committee and Advisory Board for a number of years.

I participated extensively in the activities of SMSG for several years. I was a member of the first writing session for the full four weeks; it was held at Yale University from June 23 to July 19, 1958, and I was assigned to work with the 11th grade subgroup led by Frank B. Allen. Using the reports of the Commission on Mathematics as a point of departure, the first SMSG writing session derived great assistance from them. Also the writing session derived much inspiration and encouragement from the Rockefeller Panel Report entitled *The Pursuit of Excellence: Education and the Future of America*; it was published on June 26, 1958, while the first writing session was in progress [The Rockefeller Panel Reports 1]. John W. Gardner, chairman of the panel that prepared the report, was one of the leaders of the educational reform movement. I joined the 11th grade subgroup again for two weeks during the writing session held in August 1959 at the University of Colorado in Boulder. Finally, I worked with the 11th grade subgroup for about two weeks during the writing session held at Stanford University in August 1960. Also, I participated in some of the special conferences and other activities of SMSG. William Wooten's history of the School Mathematics Study Group gives a detailed account of the establishment of SMSG and of its activities during the first four years of its existence [Wooten 1].

The International Congress of Mathematicians was held in Edinburgh, Scotland in August 1958. Since I was President of the Mathematical Association of America, it was fitting that I should attend. The Department still had a contract with the Office of Naval Research, and ONR assisted me in attending the Congress by providing funds and air transportation. I flew from Andrews Air Force Base near Washington on a MATS DC-6 airplane, with a stop in Nova Scotia, into Paris. There, for about three days, I was an ordinary tourist seeing the sights of Paris. I was completely separated from everyone who spoke English; of all the experiences of my life, this was the one in which I felt the most isolated in a foreign country. I saw one movie--The Ten Commandments--but it was in French. After several days in Paris, I flew to London and was a tourist there for about the same length of time. Then I took a train that ran non-stop from London to Edinburgh. Half of the days in Scotland were rainy and miserable, but the others were bright with sunshine and garden parties with bagpiper marching bands. The most lasting impression of the mathematical sessions is the memory of a magnificent lecture by Lev Semenovich Pontryagin; his interpreter was Lipman Bers. As soon as the Congress was over, I took a night train to a MATS base in England and flew by MATS DC-6 airplane to Maguire Air Force Base in New Jersey. I made all possible speed in order to arrive at Massachusetts Institute of Technology in time for the opening of the summer meetings of the mathematicians there.

The year 1958 brought heavy responsibilities to me as the President of the Mathematical Association of America. The Committee on the Undergraduate Program had continued its work; Duren was its chairman, and I was still a member. The Committee had completed the writing of *Elementary Mathematics of Sets, With Applications* and published it in 1958. Also, two volumes had been written by a writing group at Dartmouth College under the leadership of Professor John G. Kemeny. The Committee had obtained some modest grants from one of the private foundations, but even the foundation objected that CUP was not asking for enough money. The Committee had been only moderately successful, and in the winter of 1957-1958--after the launching of Sputnik I and II--it became clear that the Committee's efforts were entirely inadequate. Accordingly, the

Committee announced that it would resign in August 1958 so that its work could be completely reorganized.

In preparation for the reorganization of CUP, I obtained a grant from the National Science Foundation to support a conference in Washington, D. C. on May 16-18, 1958. This conference, known as the Washington Conference, adopted a set of recommendations that essentially charted the course of the Mathematical Association of America for the next ten years. Complete reports on the Washington Conference were published in the *American Mathematical Monthly* [Price 23, 24].

At the end of my term as President of the MAA, I appointed the new committee to replace the original CUP. The new committee immediately changed its name to Committee on the Undergraduate Program in Mathematics; it felt that it was necessary to specify "mathematics" since there were now many committees working on the revision of the undergraduate curriculum in other areas of science. The new committee drafted me to be its chairman.

The first problem for CUPM was to obtain financial support for its activities. SMSG was already in existence, it had already obtained its first grant from NSF, and it had already held its first writing session. There was only one place to obtain financial support on the scale demanded in the post-Sputnik period, namely, the National Science Foundation. A proposal to NSF was prepared, but it was rejected at the time of the AMS and MAA meetings at the University of Utah in August 1959. A new proposal to NSF was written, care being taken to meet the objections to the first one. A grant from the National Science Foundation was finally forthcoming in 1960.

The grant from NSF provided funds to employ a staff and to establish a headquarters for CUPM. A staff and a headquarters were absolutely essential if CUPM was to operate on the scale required in the post-Sputnik period.

Professor Robert J. Wisner of Haverford College was chosen to be the first Executive Director of CUPM; it was with difficulty that Professor A. W. Tucker and I obtained his release from his position at Haverford College. Professor Wisner received an appointment to the faculty of Michigan State University at Oakland, and the CUPM headquarters was located there from 1960 to 1963. Afterward, the headquarters was established in its permanent location in El Cerrito, California with a post office address in Berkeley. I resigned as chairman of CUPM in the spring of 1960 when it became clear that I must become the Executive Secretary of the Conference Board of the Mathematical Sciences. I remained a regular member of CUPM, however, until about 1964, and, through membership on panels and special committees, I maintained a connection with CUPM almost up to 1970. In my opinion, the Committee on the Undergraduate Program was remarkably successful in renewing both its program of activities and its personnel; it made a great contribution to the improvement of the teaching of mathematics in the United States. There is almost universal regret among the mathematicians that the National Science Foundation terminated its support of CUPM in 1972. For more than ten years NSF had supported CUPM at the level of $400,000 to $500,000 annually.

For many years the Department of Mathematics has hoped for and sought a building that would provide offices and classrooms to house its activities. The dream of a building for mathematics long antedates my arrival in the University. Dean Stouffer once said to me, "I will not live to see a building for mathematics, but you will". But I now know that I will never see a building for mathematics either.

When I first came to The University of Kansas, the entire staff of the Department of Mathematics had offices in two rooms--205 and 209 Strong Hall.

When I became an Associate Secretary of the American Mathematical Society in 1946, the Department gained the use of 215 Strong Hall, because a small inside office for my use was constructed there. When I became Chairman of the Department in 1951, I moved the Department's office from 205 to 215 Strong Hall. When Professor Aronszajn and his group arrived from Oklahoma State University in September 1951, the Department acquired several offices in Strong Annex E (located behind Strong Hall) for their use. Later the Department obtained additional offices in Annexes B, C, and D which it used for assistant instructors, research assistants, and holders of fellowships. By the time the first NSF summer institutes were held in the summer of 1957, the Department had acquired Room 115 Strong Hall; it had formerly been the office of the Department of Spanish.

But I pressed for a building for mathematics! The staff of the Department had very inadequate offices. In those days there were fourteen desks in 209 Strong Hall, and there were usually about twenty-four or twenty-five staff members assigned to them. If mathematics was ever to succeed in its efforts to obtain a building, it seemed to me that it should describe its needs and urge action at a time when there was great national support for science and mathematics. I prepared a memorandum for Dr. Murphy (I do not remember the year!) in which I outlined plans for a building that I thought would be appropriate for the Department of Mathematics. My plans must have seemed preposterous to Dr. Murphy because he never made any comment whatever about them. He did respond eventually, however, by agreeing to remodel space on the first and second floors of the east end of Strong Hall to provide offices for the senior staff. The plans for the remodeling were drawn up during 1958-1959, and the work was carried on slowly by crews from Buildings and Grounds during the years 1959-1960 and 1960-1961. After the space in Strong Hall had been remodeled, Professor Aronszajn and those who worked with him moved into offices in 115 and 117 Strong Hall, and 119 Strong Hall was the Department's seminar room. The Department's office was located in 217 Strong Hall, and the remainder of the senior staff was located in offices on the second floor of the east end of Strong Hall. The Mathematics Library was remodeled; the stacks were in 207 Strong Hall, and 209 Strong Hall became the reading room of the library. All of the Department's assistant instructors and graduate students had offices in Strong Annexes B, C, D, and E. When these annexes were torn down in preparation for the construction of Spencer Memorial Library, the Department's assistant instructors and graduate students were moved to offices in Oread Hall (where they remained until the fall of 1975). The Department was promised that its junior staff would be moved into Strong Hall very soon, but the promise was not kept because the space allocated to mathematics had been used for other purposes.

I never ceased my efforts to obtain more adequate facilities for the Department of Mathematics. In 1969-1970, my last year as Chairman, I joined with Professor Earl J. Schweppe (Chairman of the Department of Computer Science) and Mr. David Heron (Director of Libraries) in presenting plans to the University Planning Committee for a building to house mathematics and computer science activities. But further improvement in the facilities of the Department of Mathematics--which have been very poor because of the separation of the graduate students from the senior staff--now seems to depend on the eventual availability of more space in Strong Hall.

Professor Aronszajn added enormously to the prestige of the Department through research which he and his collaborators performed, through conferences which he organized, and through the distinguished visitors whom he attracted to The University of Kansas. This brief history does not permit a detailed account, but a few examples will suggest the nature and extent of these activities. Professor Aronszajn organized a Conference on Partial Differential Equations, which was sponsored by The University of Kansas and the Office of Naval Research and held on the Lawrence campus between June 15 and July 15, 1954. There were seventeen participants, five of whom came from The University of Kansas. Marcel Brelot from Paris, France and Lars Garding from Lund, Sweden were two of the participants. The summer of 1954 was an exceptionally hot one (the official temperature reached 117°), and it probably discouraged Professor Aronszajn from organizing another conference in Lawrence. In any case, his next effort was the Symposium on Partial Differential Equations; it was sponsored by the Office of Naval Research, the University of California at Berkeley, The University of Kansas, and the American Mathematical Society and held at the University of California, Berkeley, from June 20 to July 1, 1955. Professor William F. Donoghue, Jr., and Professor Kennan T. Smith were Professor Aronszajn's principal collaborators in the Department during the 1950's. Professor Aronszajn and his students, collaborators, and visitors for short or long periods produced an enormous volume of research. Much of it appeared in the famous "red reports", and much of it was published in the *Annales de l'Institut Fourier* which was edited in France by Professor Brelot. The following list indicates the number and nature of the Department's visitors between 1951 and 1968; most of them were distinguished mathematicians who were attracted by the opportunity to engage in research with Professor Aronszajn.

Argentina

Eduardo Zarantonello (spring semester, 1963)

Australia

Frank Gamblen (fall semester, 1957)
James L. Griffith (1964-1965)
Margaret Lester (1962-1963)
Ivan L. Rose (1963-1964)

<u>England</u>

Alexander P. Robertson (1959-1960)
Wendy Robertson (1959-1960)

<u>France</u>

Marcel E. Brelot (spring semester, 1954)
Gustave Choquet (fall semester, 1953)
Alexandre Grothendieck (spring semester, 1955)
J. L. Lions (March 1, 1957 - May 31, 1957)
Charles Ehresmann (spring semester, 1966)

<u>Israel</u>

Branko Grünbaum (May 1, 1959 - August 15, 1959)

<u>Italy</u>

Emilio Gagliardo (1961-1963)

<u>Japan</u>

Haruo Murakami (1963-1965)
Makoto Ohtsuka (February 15, 1959 - October 15, 1959)

<u>Poland</u>

A. Krzywicki (November 15, 1958 - July 31, 1959)
Jacek Szarski (November 1, 1958 - July 31, 1959)

<u>Sweden</u>

Rolf L. M. Andersson (1965-1966)
Lars Gårding (summer, 1954)
Lars V. Hörmander (summer, 1956)
Arne Persson (1963-1964)
Åke Pleijel (March 1, 1959 - May 31, 1959)

<u>United States</u>

S. S. Chern (October, 1968)
Uri Fixman (February 1, 1959 - January 31, 1960; May 1 - July 31, 1966)
Avner Friedman (1956-1957)
Sydney H. Gould (1953-1954)
Peter D. Lax (summer, 1954)
Arthur N. Milgram (1951-1952)
Charles B. Morrey, Jr. (two weeks in June 1952)
Paul C. Rosenbloom (summer, 1953)

The staff of the Department of Mathematics began to grow during the latter half of the 1950's. The enrollment of the University was increasing, and the growing prestige of the Department made it possible to attract some fine mathematicians to its staff. The University catalogs show that the following mathematicians have held positions on the staff since 1954:

| | |
|---|---|
| Arthur H. Kruse | 1954-1960 |
| George Springer | 1955-1964 |
| Donald R. Truax | 1956-1959 |
| Elbert A. Walker | 1956-1957 |
| Urs. W. Hochstrasser | 1957-1958 |
| James C. Lillo | 1957-1960 |
| J. C. E. Dekker | 1958-1959 |
| John B. Johnston | 1958-1964 |
| Lee M. Sonneborn | 1958-1967 |
| Charles J. Himmelberg | 1959- |

Professor Kruse received his bachelor's and master's degrees from The University of Kansas, and he received his Ph.D. degree from the University of Chicago; his research has dealt with topology and other subjects. He left The University of Kansas to accept a research professorship at New Mexico State University in Las Cruces. Professor Springer's appointment has been described already. Professor Truax was a statistician; he received his Ph.D. degree from Stanford University in 1955 and spent the year 1955-1956 at California Institute of Technology. Universities have a gentleman's agreement that they will not hire other universities' staff members within four months of the opening of school in the fall, that is, after about May 1. About August 20, 1959, while I was still at the SMSG writing session in Boulder, I received a letter from Professor Truax saying that he had accepted a position at the University of Oregon and that he had left. The Northwest was Professor Truax's home, and it is my experience that nothing stops a mathematician when he wants to go home and has an opportunity to do so. Professor Walker received his Ph.D. degree from The University of Kansas; his dissertation was written on a subject in group theory under the supervision of Professor W. R. Scott. Walker left the University to accept a position at New Mexico State University. The appointment of Professor Hochstrasser has been described already. Professor Lillo received his Ph.D. degree from Princeton University; he is a specialist on differential equations. Professor Lillo is now on the faculty of Purdue University. Professor Dekker received his Ph.D. degree from Syracuse University; he was interested especially in mathematical logic. Mrs. Dekker was very happy in Lawrence, but Professor Dekker insisted that he must live close to New York City. He accepted a demotion in rank (from associate to assistant professor) in order to obtain a position at Rutgers University. Professors Johnston and Sonneborn both received their Ph.D. degrees at California Institute of Technology; they were specialists in algebra and topology, respectively. As will be described later, Professor Johnston became a computer scientist; after spending several years at the General Electric Company in Schenectady, he accepted a position at New Mexico State University. As a result of his association with Professor W. R. Scott in the Department, Professor Sonneborn changed his field of research to group theory. He accepted a position in Michigan State University in 1967; its Department of Mathematics is strong in group theory. Professor Himmelberg received his Ph.D. degree from the University of Notre Dame; a specialist on general topology, he wrote his Ph.D. dissertation under the supervision of Professor Ky Fan. Professor Himmelberg is the only one in the list who is still a member of the Department's staff. This list of the Department's staff members emphasizes the high mobility of mathematicians during the 1950's and 1960's.

By the end of the 1950's Chancellor Murphy had brought the University to a high level of scholarly activity. Roy A. Roberts had endowed two distinguished professorships, and Chancellor Murphy had established three more with funds held by the Endowment Association [*The Graduate Magazine* 114, 115]. Professor Raymond C. Moore, the University's world-famous geologist, was appointed to a Summerfield Distinguished Professorship; a little later, Professor E. Raymond Hall was appointed to a Summerfield Distinguished Professorship, and Professor Charles D. Michener was appointed to an Elizabeth M. Watkins Distinguished

Professorship. The future of the University seemed bright.

But suddenly the University began to experience political interference from George Docking, the state's Governor. Docking had been President of the First National Bank in Lawrence, and many of those on the faculty were personally acquainted with him. It seemed that the Governor had a grudge against Chancellor Murphy, and that he was doing everything possible to embarrass the Chancellor. One of Governor Docking's favorite tactics was to disapprove requests for out-of-state travel--requests which should have been routinely approved and which should never have come to the Governor's attention. Chancellor Murphy never acknowledged Governor Docking's interference and grudge against him in any way; he suffered in silence. But finally he quietly accepted the Chancellorship of the University of California at Los Angeles and resigned from his position at The University of Kansas. The University had suffered a severe loss [*The Graduate Magazine* 122, 123]. The Board of Regents quickly selected W. Clarke Wescoe, Dean of the School of Medicine, to be the new chancellor.

Professor Aronszajn claims that the trouble between Governor Docking and Chancellor Murphy all began at his house in 1955. Although Professor Aronszajn had applied for U. S. citizenship soon after he arrived in Lawrence, he did not obtain his citizenship until after the statutory waiting period of five years. When he finally obtained his citizenship in 1955, he decided to celebrate the important occasion by inviting his friends to a party at his house (he lived then at 1313 Massachusetts Street, the former home of U. G. Mitchell). Professor Aronszajn invited Chancellor Murphy to his citizenship celebration; they had many interests and tastes in common. He also invited George Docking, because Docking was a friend with whom Aronszajn had played bridge many times. But, Aronszajn says, Chancellor Murphy and George Docking, while enjoying the punch from the punch bowl, got into an argument over "right-to-work" laws. And

Professor Aronszajn claims that Governor Docking held a grudge against Chancellor Murphy from that time on.

Late in the spring of 1959 I received an invitation to spend the year 1959-1960 as a visiting professor at California Institute of Technology. After some hesitation, I accepted. It was arranged that Professor Scott would be acting chairman of the Department in my absence. It was probably a mistake for me to spend the year at Cal Tech because I was so deeply involved in the national affairs of the mathematicians that my year in Pasadena could not be entirely successful. I was the Past President of the Mathematical Association of America and, as such, a member of the MAA Board of Governors; I was a member of the Advisory Committee of the School Mathematics Study Group; I was the Chairman of the Committee on the Undergraduate Program in Mathematics, engaged in trying to obtain financial support from the National Science Foundation and to initiate the activities of the reorganized committee; and, finally, I was the Chairman of the Conference Organization of the Mathematical Sciences, soon to become the Conference Board of the Mathematical Sciences. In addition, I was engaged in helping Dorothy Culbertson of the National Broadcasting Company in New York to make arrangements for a mathematics course to be broadcast on "Continental Classroom" during 1960-1961. As another consequence of Sputnik I and II in 1957, Professor Harvey E. White from Berkeley had given a physics course on "Continental Classroom" during 1958-1959, and Professor John F. Baxter from the University of Florida was giving a chemistry course during 1959-1960. During the first semester of 1960-1961, Dr. John L. Kelley of Berkeley, with the assistance of Dr. Julius H. Hlavaty of the DeWitt Clinton High School in New York, gave a course on modern algebra on "Continental Classroom"; during the second semester, Dr. Frederick Mosteller of Harvard, with the assistance of Dr. Paul C. Clifford of Montclair

State College, gave a course on probability and statistics. (For a reference to the part I played in arranging for these "Continental Classroom" courses, see the acknowledgments in the textbook written by Professor Kelley [Price 25, p. vii; 28].)

One example will illustrate the rigors of my travel schedule. At the end of August I drove with my family from Lawrence to Salt Lake City to attend the 1959 summer meetings of the mathematicians there. From the University of Utah I drove on to Pasadena, arriving about noon on a Saturday. Early the next morning, I flew back to the East Coast to attend a meeting!

The most important development for me during the year in California concerns my connection with the Conference Board of the Mathematical Sciences (CBMS). My active association with the organization began with a special meeting held in Chicago in connection with the 1957 spring meeting of the American Mathematical Society. The mathematicians had established their War Policy Committee in 1942 and converted it into the Mathematical Policy Committee in 1945; in 1958 the latter became the Conference Organization of the Mathematical Sciences, and a constitution and by-laws were drawn up. In December 1958 (I was then President of the MAA and Chairman of the Conference Organization) the Mathematical Association of America received a grant of $75,000 from the Carnegie Corporation of New York for the establishment of a Washington office for mathematics (the Washington Conference had recommended the establishment of this office [Price 24]). At its Salt Lake City meeting in 1959 the Association recommended that the Washington office be established by the Conference Organization with the Carnegie grant. The Conference Organization accepted the responsibility for this undertaking, and on February 25, 1960, the Conference Organization was incorporated in the District of Columbia with the new name Conference Board of the Mathematical Sciences. I was the Chairman of CBMS in 1960, but I resigned from this position, was appointed the first Executive Secretary, and opened the office of the Conference Board in Washington on July 1, 1960 (for a brief history of the CBMS, see [Price 27; S, ch. 5, sec. 2]).

During my first week in Washington I met Mr. Jonathan King of Educational Facilities Laboratories, a part of the Ford Foundation; plans made at that time quickly led to a grant of $56,500 for a study of buildings and facilities for the mathematical sciences. Professor J. Sutherland Frame of Michigan State University was the director of the study. Supplemental grants later supplied funds to publish the project report; it was beautifully printed by Columbia University Press, with large double-column pages and many drawings and photographs [Price 26]. Part III, *Mathematical Facilities for Secondary Education*, was printed separately, as well as in the complete report, for the benefit of high schools. Many free copies of the two reports were distributed, and there was a demand for them for many years.

I became one of the principal speakers (Frank B. Allen, Kenneth E. Brown, and W. Eugene Ferguson were the others) in a series of eight Regional Orientation Conferences in Mathematics that the National Council of Teachers of Mathematics conducted with financial support from the National Science Foundation. The conferences were held at the following times and places in the fall of 1960:

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| October 3-4 | Philadelphia, Pennsylvania |
| October 10-11 | Iowa City, Iowa |
| October 27-28 | Atlanta, Georgia |
| November 3-4 | Portland, Oregon |
| November 18-19 | Los Angeles, California |
| December 1-2 | Topeka, Kansas |
| December 9-10 | Miami, Florida |
| December 15-16 | Cincinnati, Ohio |

I spoke first at each conference; my talk, entitled "Progress in Mathematics and

Its Implications for the Schools", was designed to explain to the teachers and administrators who attended why new and improved mathematics programs were needed in the nation's schools. Dr. Brown followed me; he described--without showing any preference for any one of them--all of the new programs that were available for adoption in the schools. Dr. Ferguson was next; he described the steps to be taken--retraining of teachers, orientation of parents, etc.--in introducing a new mathematics program. Mr. Allen presided at the meetings, including question-and-answer sessions and panel discussions by teachers who described their own experiences with new mathematics programs, and he gave a summary of the conference at the end.

The proceedings of the eight conferences were published in a pamphlet entitled *The Revolution in School Mathematics*. This pamphlet received national and even international attention: Associated Press dispatches described it, the education page of the *New York Times* reviewed it, and the Organization of American States translated it into Spanish [Price 15]. My article in the pamphlet shows some similarities to an article I had written earlier for *The Graduate Magazine* [Price 13 and 15]. I have been told that my article was translated into Portuguese and published in Brazil; it was published later in a paperback collection of readings on education [Price 29]. The conferences were an exceedingly strenuous assignment; once more I felt that I had been a missionary for mathematics.

The year 1960-1961 involved living in Washington during a very hard winter, working on the many projects in which I was involved, and a great deal of traveling, in addition to the eight conferences. I spent the month of July 1960 in Washington establishing the CBMS office and laying the groundwork for the project to study buildings and facilities for mathematics. After a strenuous search in the District of Columbia and in Virginia, I located a nice house in

Bethesda, Maryland for my family. In August I spent about two weeks with the third SMSG writing session, held at Stanford University. At the end of August the program of the forthcoming regional orientation conferences was presented at the meeting of the National Council of Teachers of Mathematics in Salt Lake City. Immediately afterward, I moved my family by automobile to Bethesda. I had been fortunate in finding a very pleasant home, at 7200 Fairfax Road, for my family, and there were good schools for the children. The spring in Bethesda was the most beautiful I have ever seen--azaleas, rhododendron, mountain laurel, dogwood, red bud, and cherry blossoms!--but before spring came there was the winter. After the regional orientation conference in Miami, Florida, I arrived back in Bethesda on Saturday night, December 10, 1960; the next morning as I was eating breakfast I observed that it was beginning to snow. There followed the first of five heavy snows in the winter of 1960-1961. Washington traffic is impossible under the best of circumstances, and the traffic department assumes that it never snows; in this setting, the difficulties created by a heavy snow are easily imagined. The most extreme traffic problems occurred on January 19, 1961--the day before John Kennedy was inaugurated as President. On that day a fine snow began sifting down at about noon. By four o'clock, about half an inch of slick snow had accumulated on the streets; the government, fearing that driving conditions might become bad, released all of its employees simultaneously at that time. I left the AAAS Building at 1515 Massachusetts Avenue about 4:30 p.m. to drive the seven miles to my house in Bethesda, but I found myself caught in the most tremendous traffic jam I have ever encountered. The streets of the entire city were packed solid with cars, and, whether the lights were green or red, there was essentially no movement. Fortunately, I had filled my car with gasoline the day before; I proceeded as rapidly as I could and reached home about 10:30 p.m. I had made the seven mile trip in six hours--with my motor running the entire time! Many were not so fortunate: they ran out of gas, raised the hoods of their cars, and abandoned them where they had stalled. It took a week to clear the abandoned cars from the streets after the awful traffic jam. The parade down Pennsylvania Avenue was held the next day as planned, but only because the Army hauled the snow away in trucks during the night--about six or eight inches of it fell before the next morning.

Inauguration morning (January 20) was clear; the temperature was about $20^{\circ}$, and there was bright sunshine on the deep snow. My daughter, Lucy Jean, was awake early with demands that she be taken to the inauguration. From her point of view, the only reason for spending the winter of 1960-1961 in Washington was so that she could attend Kennedy's inauguration. Bad as the conditions were, and in spite of my experiences in the traffic jam the night before, I agreed to take her; I felt that such interest should be rewarded. I drove Lucy Jean to the home of a cousin just behind the Library of Congress; from there I watched the inauguration on television, but Lucy Jean went to the Capitol and saw at least a part of the proceedings in person. Robert Frost's difficulties in reading his poem in the bright sunlight, the fire in the heater during Cardinal Cushing's prayer, and Kennedy's inaugural address are all matters of history.

During the years 1960 and 1961, I engaged in a variety of activities; looking back now, I can see that these years formed a turning point in my career. I made a guest appearance on Kelley's course on "Continental Classroom"; according to my memory, it was Tuesday, November 8, 1960--the day Kennedy was elected President. During that fall, I organized a conference in Washington, and I edited and published its report. Professor A. W. Tucker of Princeton University was the Chairman of the Conference Board of the Mathematical Sciences during the calendar years 1961 and 1962; together we tried to promote the development of the CBMS. Many of the mathematicians, however, did not want the Conference Board of the Mathematical Sciences to succeed, and they largely prevented it from accomplishing anything. Some of the projects which the CBMS attempted were completed later by the Mathematical Association of America after being blocked by the AMS or others. The CBMS was similar in many ways to the United Nations, and it suffered the same difficulties. Many mathematicians had loyalties to individual member organizations of CMBS--Association for Symbolic Logic, Institute of Mathematical Statistics, National Council of Teachers of Mathematics, Society for Industrial and Applied Mathematics, AMS, and the MAA--which conflicted with their loyalty to the umbrella organization; loyalty to the individual member organization usually took precedence over loyalty to the CBMS.

In January 1961, I became a member of the United States National Commission for UNESCO as a result of my nomination by the American Mathematical Society. My appointment for my first three-year term was signed by Christian A. Herter, Secretary of State, in the closing days of the Eisenhower administration. I served a second three-year term, my appointment three years later being signed by Dean Rusk, Secretary of State. The U. S. National Commission is a body of one hundred individuals. Many of them represent large and important national organizations; all of them are interesting persons and some are persons of great distinction. The Commission usually met twice a year. In 1961 there was a special conference in Boston on the new nations of Africa; in 1963 there was a special conference in Chicago on the Common Market in Europe; and in 1965 there was a special conference in Kansas City on foreign aid and development. There were a number of very enjoyable meetings in the new State Department Building in Washington. I was placed on the Science Committee, and this position brought me into contact with members of the National Academy of Sciences and some of the leading scientists of the day. The American Mathematical Society engaged in many activities which promoted the interests of UNESCO, but the AMS did not support UNESCO as an organization in any way. As a result, my position on the Commission was a very weak one. On the whole, my membership on the UNESCO Commission was a frustrating experience, similar in many ways to my efforts to promote CBMS. The total world budget of UNESCO was comparable to that of one big midwestern university; it was completely inadequate to establish the world program that UNESCO tried to promote. And, as always, national interests prevailed over international interests--over the good of the whole. Some day there must be, and there will be, a world government; in the meantime we must work to enlarge the spheres of interest and concern of more and more individuals. And for this reason I believe that it is necessary to support and promote both the Conference Board of the Mathematical Sciences and the United States National Commission for UNESCO.

I should now like to digress from the chronological order to describe my experiences as a member of the Board of Trustees of Argonne Universities Association from 1965 to 1969. Argonne National Laboratory, located about twenty-five miles southwest of Chicago, is a national laboratory of the Atomic Energy Commission. It was established soon after World War II as an outgrowth of the work on nuclear fission that had been carried on at the University of Chicago; the University of Chicago operated Argonne National Laboratory (ANL) for the AEC. Other universities of the Midwest became concerned because they did not have adequate access to the special research facilities at ANL; these facilities were so large and expensive that they could be provided only in a national laboratory and not in individual universities. The dissatisfaction with the ANL became so great that eventually, in the 1950's, a group of universities in the Midwest formed the Midwest Universities Research Association (MURA) in the hope that, by pooling their interests and efforts, they could obtain funds from the federal government to build a large accelerator for their own research in high energy physics. President Johnson denied the request of MURA for funds and promised instead more satisfactory access to the facilities of ANL. Argonne Universities Association (AUA) was formed to take advantage of this promise. AUA elected its first Board of Trustees in October 1965; its by-laws required that the Board contain at least one mathematician, and I accepted an invitation to be the mathematician on the AUA Board of Trustees. Very soon thereafter AUA had thirty member universities; they covered a region which extended from Pennsylvania State University on the east to the Universities of Texas and Arizona on the southwest. AEC, AUA, and the University of Chicago negotiated a tripartite contract under which each of the three parties had certain responsibilities and a certain degree of control. AEC supplied funds to support the Laboratory, and the University of Chicago operated the Laboratory. One of the AUA publications states:

> The AUA is an association of universities which was established to give further stimulation to scientific and technological advancement in the Midwest and in the nation, and to promote increasingly close and mutually beneficial relationships between the educational community and the Argonne National Laboratory. Under a tripartite contract with the AEC and The University of Chicago, AUA has responsibility for formulating, approving, and reviewing policies and programs of the Laboratory, and, in collaboration with The University of Chicago, for the development of long-range objectives for the Laboratory.

I was appointed Chairman of the AUA Board Committee for Physical Sciences and Mathematics. This assignment made me a member of the Executive Committee of the AUA Board of Trustees. The Board Committee for Physical Sciences and

Mathematics was responsible for keeping the AUA Board of Trustees informed about budgets, activities and programs, and needs and problems in the Applied Mathematics Division, the Chemistry Division, the Physics Division (but not the High Energy Physics Division!), the Solid State Science Division, and a part of the Materials and Metallurgy Division. In order to carry out my responsibilities I made many visits to Argonne National Laboratory, and I attended many meetings of the Executive Committee and of the Board of Trustees, some of which were held at O'Hare Airport. I arranged and attended a meeting of the Board Committee for Physical Sciences and Mathematics with representatives of the Atomic Energy Commission in Washington, D. C. on May 29, 1969. I attended a meeting of the AUA Executive Committee that was held at Idaho Falls, Idaho on September 7, 1967; the meeting was held in Idaho so that the committee could visit the facilities of Argonne National Laboratory at the national reactor testing site west of Idaho Falls. In October 1967, I was reelected for a second term and served as a member of the AUA Board of Trustees until October 1969.

My membership on the AUA Board of Trustees was an interesting experience which I thoroughly enjoyed. I met many interesting people that a mathematician would not ordinarily meet. There were university presidents and scientists from other fields in universities and in industry. Murray Joslin was a retired vice president of an electric utility who had helped in the construction of a nuclear power plant; Michael Ference, Jr., was a physicist and the Vice President for Research of the Ford Motor Company. But the experience was also frustrating; it illustrated once more the difficulty that groups of strong organizations encounter when they try to cooperate for the common good. As in so many other cases, what was perceived as the best interests of individual member organizations often prevailed over the welfare of the umbrella organization. This situation is well illustrated by my last contact with AUA. Dr. Philip N. Powers, President of Argonne Universities Association, had worked for several years to develop a program which would join AUA and ANL in cooperative studies of environmental pollution. At a special conference held on November 16, 1971, Dr. Powers sought the approval of the member universities for the establishment of a program of environmental studies under the control of AUA; I attended this conference as the delegate of The University of Kansas and a substitute for Dean Argersinger. The delegates withheld approval by a vote of 18 to 11; many feel that the Midwest will suffer because the universities refused to cooperate on environmental studies through Argonne Universities Association.

An excellent account of Argonne National Laboratory and of Argonne Universities Association has recently been published in *Science* [Price 30].

But I must return now to the Conference Board of the Mathematical Sciences in Washington in 1961. As the year 1960-1961 drew to a close, Professor Tucker, the Chairman of CBMS, insisted that I continue another year as the Executive Secretary. I had already been on leave for two years, however, and The University of Kansas would not grant leave for a third year. The compromise that was worked out was that I would return to Lawrence and also continue as Executive Secretary of CBMS. I moved my family back to Lawrence in June 1961, and from that time until the end of the summer of 1962 I carried on the work of CBMS by commuting to Washington. I usually spent about a week in Lawrence and then a week in Washington. The principal CBMS accomplishment during 1961-1962 was the completion of Professor Frame's project on buildings and facilities for the mathematical sciences. This project was completed in the summer of 1962, and the report was published in 1963. Washington is the science capital (for science policy and funding) as well as the political capital of the nation, and many of the professional organizations in the various fields of science have their headquarters there. A mathematics representative in Washington can be useful to the mathematicians by serving as a two-way channel of communications between the agencies located in Washington and the mathematicians of the nation. By 1961-1962 I had learned enough about Washington so that I could be helpful. On one occasion I obtained some important information for the American Mathematical Society on short notice and in one day's time; I succeeded because I had become acquainted with a staff member in the office of the Science Adviser in the Department of State. But my total accomplishments from 1960 to 1962 were very modest, because there continued to be great opposition to the Conference Board. The CBMS deliberately reduced its activities to a very low level in an effort to survive. And it has survived; today it is publishing a *Newsletter* and it is operating several useful projects. In recent months there has been much discussion of the role CBMS should play and of possible modifications of CBMS to make it an even more significant organization. CBMS has made some progress, but it is still not a spectacular success; its final position among the mathematicians will be determined by its accomplishments in the future. As for myself, however, the two years I spent as Executive Secretary of the Conference Board of the Mathematical Sciences seem to have been one of the less successful periods of my life.

The University's first serious problem in the 1960's grew out of its rapidly increasing enrollments. Enrollments had been swelling steadily, but the flood--resulting from the post-war baby boom which began in 1946--was scheduled to reach the campus in 1964. The University emphasized the problems as vigorously as it could during Dr. Murphy's last year as chancellor [*The Graduate Magazine* 119, 120, 121], but it was difficult to obtain the funds required to provide faculty members, academic buildings, and dormitories. The University built its system of large dormitories; it was less successful in providing academic buildings because they could not be made to produce income. And the problem of providing an adequate faculty with a good salary scale was never completely solved.

As I have stated earlier in this chapter, three events were largely responsible for the great efforts that the United States made in education, science and mathematics, and research and development and for the huge sums of money that the nation appropriated for these activities in the years between 1945 and 1970. The first of these events was World War II and the report entitled *Science: The Endless Frontier* which Vannevar Bush submitted to President Truman in July, 1945. The second event was the launching of Sputnik I and II by the Russians in October and November, 1957. The third event--and the time has come to discuss it now--was the race to the moon; it was initiated when the Russian, Yuri Gagarin, orbited the earth on April 12, 1961, and it was entered by the United States when President Kennedy made his historic pronouncement on May 25, 1961: "I believe we should go to the moon . . . before this decade is out".

This decision placed renewed emphasis on the production of mathematicians, scientists, and engineers; furthermore, it expanded several programs established earlier and created new ones to assist in this production. The budget of the National Science Foundation was increased and many of the programs it supported were enlarged. The Title IV Fellowship program of the National Defense Education Act was greatly enlarged, and the National Aeronautics and Space Administration established a program of predoctoral traineeships.

Professor Aronszajn's research project had been supported during the 1950's by his contract with the Office of Naval Research, but during the 1960's he obtained large grants from the National Science Foundation to support his activities. As NSF budgets increased, the agencies of the Department of Defense were restricted more and more by Congress to use their funds for strictly mission-oriented research. By the end of the 1960's, support of pure science had been shifted so completely to the National Science Foundation that Professor Aronszajn gave up his ONR contract completely.

The availability of ample research funds and the relative scarcity of mathematicians led inevitably to inflation. The salaries of mathematicians, scientists, and engineers increased dramatically during the 1960's. The University's overhead rate increased also; eventually the overhead rate exceeded fifty percent of direct costs. Some of those who received grants complained that the University was claiming too large a share of their funds, but they did not complain about their own salary increases. The plentiful supply of research funds led to restlessness and instability of faculties. There was much competition among the universities for the limited supply of mathematicians, and mathematicians moved as a result of offers initiated by other universities. In many cases, mathematicians sought other positions; sometimes faculty members adopted the attitude that "you had better be nice to me or I will take my grant and go to another university".

A large project developed in the Department as a result of the expanded activities of the Committee on the Undergraduate Program in Mathematics and the expanded budgets of the National Science Foundation. I remained a member of CUPM through 1963, and I was a member of its Panel on Mathematics for the Biological, Management, and Social Sciences for many years. Early in 1962 Professor Robert J. Wisner, Executive Director of CUPM, came to Lawrence and urged the Department to apply for an NSF grant to develop some new courses in the BMSS field and to write appropriate textbooks for them. I was still commuting to CBMS in Washington, but Professor W. R. Scott and I, assisted by

Professor Wisner, prepared and submitted a proposal to the National Science Foundation.

A large grant was received in July 1962, and work began immediately. Professor Fred S. Van Vleck had already accepted an appointment which began in September 1962; he participated in the work of the new project during the months of July and August 1962. After discussions with the School of Business and others, the Department of Mathematics dropped Mathematics 10, Mathematical Theory of Investment, the course it had taught so long for students in business. In its place I arranged for the Department to offer two sections of Mathematics 11 and 12 during 1962-1963. Mathematics 11 was a course on linear equations, matrices, algorithms and flow charts, and probability theory; Mathematics 12 was a course on elementary calculus. Both courses were oriented toward the biological, management, and social sciences; and the illustrations, applications, and exercises were chosen from these fields.

The first major writing session was held during the summer of 1963. The principal staff consisted of Professors John B. Johnston, Fred S. Van Vleck, and myself, with Miss Patricia Swope as assistant and typist. Although I devoted as much time to the project as my duties as Chairman would permit, I never drew any salary from the project. In the summer of 1963 this team wrote and published in a preliminary edition, from copy typed by Miss Swope, *An Introduction to Mathematics*, volume 1, Part I, 423 pages, and Part II, 373 pages. The printed books were available for use during the fall semester of 1963. Volume 1 dealt only with the topics that are now described by the term "finite mathematics". We had intended volume 2 to be calculus, but, although drafts of it were written by Professor Johnston and later by Professor John T. White, we were unable to complete a calculus that we considered satisfactory.

*An Introduction to Mathematics* was completely rewritten and published as two books. The first book, *Linear Equations and Matrices*, was written in the summer of 1964, and it was published by Addison-Wesley Publishing Company early in 1966 [Price 17]. The writing of *An Introduction to Mathematics* and *Linear Equations and Matrices* resulted in the loss of Professor Johnston from the Department's staff. None of us knew the details of computing machines and programming when we started out, but we decided that we should include a discussion of algorithms and their description by flow charts. Professor Johnston volunteered to investigate and to write this part of the book. He became deeply interested in computing machines, but since he did not find enough knowledgeable colleagues in the field of computer science at The University of Kansas, he left Lawrence at the end of the summer of 1964 and accepted a position in the Research Laboratory of the General Electric Company in Schenectady. When it came time to write the second book, Professor Van Vleck and I agreed that we would do the writing if Professor Johnston would make the index. Professor Johnston sent us the index in the form of a print-out from his computing machine. After puzzling over what to do with this print-out, we finally sent it to Addison-Wesley and the index was set in type from the computer print-out. This second book, *Sets, Functions, and Probability*, was published by Addison-Wesley early in 1968 [Price 18]. Miss Patricia Swope, now Mrs. Thomas Croat, did all of the typing for *Linear Equations and Matrices* and also for *Sets, Functions, and Probability*, as well as for the original book entitled *An Introduction to Mathematics*; also she assisted with the preparation of answers to the exercises. The Department has used *Linear Equations and Matrices* as a textbook for Mathematics 11 ever since it was published in 1966. *Sets, Functions, and Probability* is too long and too difficult, however, and the Department has never used it as a textbook; it was translated into German and published in Germany in 1974 as two paperback volumes, *Mengen, Funktionen und Wahrscheinlichkeit* [Price 18].

While the United States promoted education and research in mathematics, science, and engineering at home in its race for security, prestige, and the moon, it promoted foreign aid and development overseas; furthermore, the universities and their faculties were expected to participate in and to support all of these activities. I shall now describe two examples of my own involvement in foreign aid and educational development.

The American Mathematical Society and the Mathematical Association of America held winter meetings in Berkeley, California between Thursday, January 24, and Monday, January 28, 1963. Shortly after I arrived in Berkeley I received a telephone call from Mr. Peter Fraenkel of the Ford Foundation in New York City in which he requested that I come to New York for briefings on Monday, February 4, 1963, and that I depart immediately thereafter for Lima, Peru on a mission for the Ford Foundation. I telephoned Dean Waggoner to ask what response the University wanted me to give to this completely unexpected request; Dean Waggoner said "go". I telephoned Mr. Fraenkel that I would take the assignment.

I did not have even a passport, but with the help of a UNESCO friend in the Department of State, I obtained one in record time. Orientation and enrollment for the University's second semester began on Wednesday, January 30. On Sunday, February 3, I flew to New York for the briefings that had been scheduled for Monday, February 4. There I learned the purpose of the trip to Peru. The Schools of Engineering in the universities in the Mid-America State Universities Association (MASUA) were planning to establish a project with Ford Foundation support to help the National Engineering University in Lima, Peru. A group of three consultants was being sent to Lima to investigate, prepare a report, and make recommendations to the Ford Foundation. Iowa State University would have charge of the proposed project, and Dean George R. Town, Dean of the School of Engineering of Iowa State University, was present at the briefings at the Ford Foundation on February 4. We would be joined in Lima by Dr. Rodolfo Low-Maus, an European-born and educated chemical engineer who had lived for many years in Colombia, South America. Dean Town proceeded to Lima, but I returned to Lawrence; with the short notice I had received, I had been unable to complete my preparations to depart. Monday, February 4--the day I was being briefed in New York--was the first day of classes for the second semester. I was in Lawrence again for Tuesday, Wednesday, and Thursday. The Ford Foundation made my travel arrangements and supplied a first-class ticket. I departed from Kansas City on Friday morning, February 8 (a bare two weeks after I first heard about the trip!) and flew to Chicago. From there I flew non-stop to Mexico City on a Mexican Airlines English Comet; we arrived in Mexico City about 6:00 p.m. We departed from Mexico City shortly after midnight on a Canadian Pacific Airlines long-range DC-8, and flew non-stop to Lima, Peru. (This Canadian Pacific flight started in Hong Kong and made stops in Tokyo, Vancouver, Mexico City, Lima, Santiago, and Buenos Aires.) We flew at an altitude of 25,000 feet, and it was beautiful but frightening to see the peaks of the Andes rising through the layer of cloud almost up to our altitude as we flew along the coast of Peru. We arrived in Lima about 9:00 a.m. on February 9, 1963. My plane was greeted on arrival at the airport by a large and very enthusiastic crowd; I soon learned, however, that the welcome was not for me but for a former candidate for President who was arriving on the same plane.

Dean Town and I stayed at the Hotel Crillon near the Plaza San Martin in Lima. I was at a disadvantage from the beginning of this trip. First of all, I had arrived late, and it was practically impossible to catch up. Also, I was at a disadvantage because of the language. I had never studied Spanish, and the two weeks' notice that I had received for the trip provided little opportunity to study even a phrase book. Dean Town knew Spanish. Furthermore, Dr. Low-Maus was a man of ability, distinction, and much experience; he had served as the President of the University of Santander in Bucaramanga, Colombia. I immediately joined the others in an effort to carry out our assignment.

Our assignment was to write a report with recommendations concerning the proposed Ford Foundation project at the National Engineering University (Universidad Nacional De Ingeniería). It is a relatively modern university, having been established about 1875 by Polish engineers; it had an enrollment in 1963 of about 5300 students. We visited the various laboratories and we talked with many faculty members; we had a long session with a group of students. Dr. Low-Maus, with his extensive knowledge of South American conditions, customs, and sensitivities, helped us greatly and saved us from many blunders. Our work was carried on under the supervision of Mr. Robert S. Wickham, the Ford Foundation representative in Bogota, Colombia.

I met Dr. José Tola Pasquel, Director of the Instituto de Matemáticas Puras y Aplicadas; his Institute was associated with the National Engineering University, but it was located at some distance from the campus. Several members of Dr. Tola's Institute had studied in the United States, and they performed a real service by translating some of the mathematical publications from the United States into Spanish.

We were royally entertained. The Rector, Dr. Mario Samamé Boggio, entertained us at a formal and elaborate luncheon at the Club Nacional on the Plaza San Martin. Dr. Tola took me to lunch at a beautiful country club. Dr. Monge, a metallurgist who had taught at The University of Kansas and who was a nephew of the doctor who was famous for his studies of high altitude medicine, invited me to dinner at his apartment at 10:00 p.m. The hour was difficult for one who was working a steady and very full schedule on North American hours.

On the two Sundays that I was in Lima, we managed to do a little sightseeing. We visited some Inca ruins just outside Lima. For a primitive people, their accomplishments were truly remarkable. On the second Sunday we rented a car and drove east from Lima into the Andes Mountains. By driving a distance of about eighty-five miles, we reached an elevation of more than 12,000 feet. There is a narrow plain along the ocean; it varies in width from practically nothing to ten or fifteen miles. This sea-level strip by the ocean is the most complete desert that I have ever seen. Lima is located on this plain against the base of the mountains about ten miles from the ocean; a small river that comes down from the mountains flows through the city and into the ocean. One Saturday evening we visited a very pleasant ocean resort at Ancon, located about twenty-five miles outside Lima. Lima is a city of extremes; although there are depressing slums on the edge of the city, Lima is one of the most beautiful cities in the world. Its palm-lined avenues, its magnificent squares, and its flower-filled residential areas are among the finest that can be found anywhere.

Although our principal mission was to the National Engineering University, we nevertheless visited three other universities in or near Lima. We visited the Universidad Nacional Mayor de San Marcos; located then near the Plaza San Martin in Lima, it is the oldest university in the Western Hemisphere. We visited the Pontificia Universidad Católica del Perú in Lima; its very Peruvian Rector was Father McGregor. Finally, we visited Universidad Agraria; it is a really fine school of agriculture, located at La Molina about eight miles outside Lima.

Dean Town, Dr. Low-Maus, and I completed--with the help of two bilingual secretaries whom we borrowed from one of the engineers (Tarnaviewski) in Lima--

a typed report of 105 pages. The report was finished at 11:25 p.m. on Friday, February 22, 1963. I ran for the airport bus. The courtesy and cordiality with which we were treated are indicated by the fact that one of the officials from the National Engineering University and his wife came to the airport to see me off at 1:00 a.m. on February 23. I flew that day to Washington by way of Miami; I went to Washington because a UNESCO meeting required my presence there.

The Ford Foundation considered our mission successful, and it supported the project that had been proposed by Dean Town and the MASUA universities. Staff members from various MASUA universitites went to Lima to serve as assistants and advisers to the National Engineering University. Fred Kurata, University Professor of Chemical Engineering, and Kenneth E. Rose, at that time Professor of Mining and Metallurgical Engineering, each spent a year or more in Lima. Dean Town later made numerous trips to Lima to supervise the project.

There were continuing pressures on American universities during the first two-thirds of the 1960's to help the universities in developing countries. Although Dean McNown elected to work with some of the African universities and some other members of the School of Engineering had given help to universities in Egypt, The University of Kansas chose on the whole to work with Latin American universities. Dr. Murphy developed a cooperative program with the University of Costa Rica which has continued without interruption. Much of the financial support for these programs came from the U. S. Agency for International Development (AID), but the Ford Foundation made highly important contributions also. Private funds were especially welcome and successful because they were free from the taint of government control.

The University of Kansas contributed to the Ford Foundation-supported project at the National Engineering University in Lima, Peru. The University received another call for help from the Ford Foundation in 1965. The University of Oriente is a new university that was established in the eastern part of Venezuela about 1960. The Ford Foundation decided to help Oriente; because it was new, it might be easier to upgrade it than some of the older universities. Early in 1965 a group of officials from the University of Oriente visited several universities in the United States that had been selected as possible collaborators. The University of Oriente chose The University of Kansas to work with it in the Ford Foundation project. The project came under the supervision of Dean Waggoner.

Since the project was designed to upgrade Oriente's School of Basic Sciences, Dean Waggoner arranged to send the following team of four on a two weeks' inspection trip to Cumaná to make plans and preparations: Professor Jacob Kleinberg, Chairman, Department of Chemistry; Professor G. Baley Price, Chairman, Department of Mathematics; Professor David B. Beard, Chairman, Department of Physics; and Professor A. Byron Leonard, Chairman, Department of Zoology. Although we traveled separately, we all arrived in Cumaná on Sunday, March 28, 1965. I had flown on March 27 from Kansas City to New Orleans, and from New Orleans (with a stop in Maracaibo, Venezuela) to Maiquetía, the port for Caracas. I spent the night of Saturday, March 27, at the Macuto Sheraton Hotel about ten or fifteen miles from Maiquetía. The next morning I flew east along the coast of Venezuela to Cumaná; there our party of four stayed at the Cumanagota Hotel by the ocean on the western edge of the city. Cumaná is ancient--in 1965 it had already celebrated the 450th anniversary of its founding--, but the hotel was one of the new, state-owned, tourist hotels. Surrounded by cocoanut palm trees, shrubs, and flowers, the Cumanagota Hotel had one of the finest swimming pools that I have seen anywhere. During our stay there, we were almost the only guests in the hotel. For a few minutes each evening before dinner we sat on the porch and watched the pelicans fly along the beach as the sun went down into the Caribbean Sea.

The two weeks we spent in Venezuela were devoted to discussions with members of the Oriente faculty and administration (there were many meetings around a beautiful red mahogany conference table in the Oceanographic Institute), to visits to three of the four campuses of the University of Oriente, and to the writing of reports. The main campus is located on Cerro Colorado on the edge of Cumaná. One day was spent visiting the School of Engineering at Porto La Cruz; I was warmly greeted on my arrival there by a faculty member I had known when he was a student at The University of Kansas. On the second Sunday we flew to Ciudad Bolivar on the Orinoco River to visit the School of Mining and the School of Medicine located there. We returned to Cumaná on Monday, but we did not visit Husepin where the School of Agriculture and Petroleum Engineering were located. Venezuela is rich in natural resources, and it has great possibilities for growth and development.

Throughout our stay in Venezuela we had the help and supervision of Mr. Dieter K. Zschock, one of the assistants of Mr. Robert S. Wickham in the Ford Foundation. Although young, Mr. Zschock was very capable and effective. Soon after our trip to Venezuela, he returned to the Graduate School at Princeton and wrote a dissertation based on his experiences with the Ford Foundation in Latin America. After that, he accepted a position at the State University of New York at Stony Brook.

On Saturday, April 10, the four chairmen and Mr. and Mrs. Zschock flew from Cumaná to Caracas. The city, only eighteen miles from the ocean, has an elevation of 3,000 feet; it lies in a bowl surrounded by high mountains. We spent Saturday seeing the sights in Caracas; we stayed at the Avila Hotel, where the Ford Foundation had its Caracas headquarters. On Sunday, April 11, we flew from Maiquetía (with a stop at Maracaibo) to Miami; from there we proceeded through Atlanta and St. Louis to Kansas City and Lawrence.

The project that was established at the University of Oriente was described as follows in a news bulletin issued on October 25, 1965, by Mr. Daniel H. Janzen, Coordinator.

> A cooperative program between the University of Kansas and the Universidad de Orienta in Cumaná, Venezuela, is now in full swing. Its purpose is to strengthen the School of Basic Sciences in the Universidad de Oriente (UDO), and the outlook is very bright for success in this direction. The program is initially for two years, with a three-year extension planned; it is supported by a $400,000 grant from the Ford Foundation, with $302,000 as backstopping expenses from UDO. Basically, it involves KU faculty members and graduate students as advisors and faculty at UDO in Venezuela, and UDO faculty members working on master's degree programs at KU.

The Department of Mathematics was expected to send staff members to Cumaná to help the University of Oriente, and a notice on the Department's bulletin board brought the volunteers that were needed. Professor Philip R. Montgomery and two graduate students, Mr. James S. Dukelow, Jr., and Mr. Harold W. Mick, agreed to spend two years in Cumaná. During the second of these years, Professor Montgomery was the Cumaná director of the project.

The University of Oriente sent six of its young faculty members to Lawrence to study English during the summer of 1965; two more arrived in September. The group that came in the summer included Mr. Rafael Arias and Mr. José Chaparro, two instructors in mathematics from Oriente. Mr. Chaparro obtained a master's degree in mathematics; he showed real ability and the Department tried to keep him so that he could continue for a Ph.D. degree. Mr. Arias, who was single, was not very happy in Lawrence and was not entirely successful. Those who came later in mathematics were not very successful either. Some of the faculty members of the University of Oriente disliked the Ford Foundation project from the beginning because they feared that standards would be raised to a level they could not meet. Their fears were well founded; for example, the Chairman of Oriente's Department of Mathematics lost his position in the University after he was unsuccessful as a graduate student at The University of Kansas.

During the 1960's the federal government--through the National Science Foundation, the Office of Education, and other agencies--supplied some funds for buildings and facilities. J. W. Ashton, who had once been a professor of English in The University of Kansas, retired about 1964 from an administrative position in Indiana University and accepted the position of Director of the Division of Graduate Academic Facilities in the Bureau of Higher Education in the Office of Education in Washington. In February 1965, I was appointed a consultant by Mr. Ashton so that I could help with the work of his division. Sometimes I attended panel meetings in Washington at which applications for funds were evaluated, but usually I joined a staff member from Mr. Ashton's office for a site visit to a university that had applied for funds. I made site visits at Princeton, Rutgers, the University of Connecticut, the State University of New York at Stony Brook, the University of Minnesota, Iowa State University, the University of Texas at Austin, the University of California at Berkeley, and the University of California at San Diego. I continued as a consultant for the Division of Graduate Academic Facilities for about five years, that is, until Congress stopped appropriating funds for buildings and facilities.

The increasing enrollments of the 1960's demanded an enlarged faculty, and the recruiting of staff members, assistant instructors, and graduate students became one of the major activities of the chairman and of the Department. The

NSF summer institutes that the Department had conducted and my travels as a visiting lecturer had helped to attract students, but the Department's growing prestige was certainly the most important factor in its success in attracting both graduate students and faculty members.

There were four important additions to the staff in 1960; they were Swarupchand Mohanlal Shah (1960-1966), Robert D. Adams (1960- ), William C. Nemitz (1960-1961), and Mrs. Carol H. Bassett (1960-1964). Professor Shah, from India, was a specialist on entire functions in the theory of functions of a complex variable. He was a very successful member of the staff, because many students enrolled in his classes and chose him to supervise their theses. Professor Adams, a specialist on functional analysis, received his Ph.D. degree in 1960 from the University of Minnesota; for several years he was a member of Professor Aronszajn's research project. Professor Nemitz received his Ph.D. degree from Ohio State University in 1959. In 1961 he accepted a position at Southwestern at Memphis; he left The University of Kansas because he disliked a large university and he feared that he would have to teach large classes in Lawrence. Mrs. Bassett was an instructor and an able assistant to the chairman.

Professor Robert Schatten (1946-1961), the first mathematician to join the Department's staff after World War II, resigned in 1961. He held a position at the State University of New York at Stony Brook during 1961-1962; since 1962 he has been a member of the faculty of Hunter College in New York City.

Professors Nemitz and Schatten were the only ones who resigned from the staff in 1961; three new members were added. They were Professor Paul J. McCarthy (1961- ), Professor Richard G. Hetherington (1961- ), and Professor Pawel Szeptycki (1961- ). Professor McCarthy became a leading member of the Department's group of algebraists; he has taught many advanced courses, written two books [McCarthy 1, 2], and supervised many theses. As I have explained already, Professor Hetherington received his Ph.D. degree from the University of Wisconsin in 1961; he held a joint appointment as Director of the Computation Center and as a member of the staff of the Department of Mathematics. Professor Szeptycki spent his early life in Poland, but he received his Ph.D. degree in South Africa. A specialist in functional analysis, he has been a member of Professor Aronszajn's research project since he first joined the staff. Emilio Gagliardo arrived from Italy in 1961 to work for two years with Professor Aronszajn.

Professor William F. Donoghue, Jr. (1952-1962) was the only member of the staff who resigned in 1962; two new members were appointed and there were three visitors. Professor Fred S. Van Vleck (1962-  ) received his Ph.D. degree from the University of Minnesota in 1960 and served as an instructor in mathematics at Massachusetts Institute of Technology from 1960 to 1962; he is a specialist on differential equations and control theory. Professor John T. White (1962-1965) received his Ph.D. degree from the University of Texas in 1962; his research was in the field of functional analysis. Miss Margaret Lester from Australia was a visiting lecturer during 1962-1963, and Peter Wilker from Switzerland was a visiting assistant professor. Professor Eduardo Zarantonello from Argentina was a research associate, working with Professor Aronszajn, during the spring semester of 1963.

No one resigned in 1963, but there were six new members of the staff and three visitors in September 1963. Professor Robert D. Brown (1963-  ) received his Ph.D. degree from the University of California at Berkeley in 1963 for a dissertation written under the supervision of Professor Hans Lewy; he has been a member of Professor Aronszajn's research project ever since he came to The University of Kansas. Professor Günther W. Goes (1963-1964), a native of Germany who had studied also in Canada, is a specialist on Fourier series, sequence spaces, Banach algebras, and harmonic analysis. Professor Martin S. Hanna (1963- ), one of Professor Kennan T. Smith's students, received his Ph.D. degree from the University of Wisconsin in 1963; he was a member of Professor Aronszajn's research project for several years. Professor John H. Harris (1963-1966) received his Ph.D. degree from the University of Illinois in 1963; he is a specialist in analysis. Professor Joe L. Mott (1963-1965) received his Ph.D. degree from Louisiana State University in 1963; he is a specialist on algebra. Professor John A. Pfaltzgraff (1963-1965), a specialist on the theory of functions of a complex variable, received his Ph.D. degree from the University of Kentucky in 1963. In addition, Professor Haruo Murakami (1963-1965) from Japan was appointed to a research associateship in the fall of 1963; he was associated with Professor Aronszajn's research project. Professor Ivan L. Rose from Australia, a visiting assistant professor during 1963-1964, held a joint appointment in the Department of Mathematics and in Correspondence Study. Arne Persson from Sweden was a research associate on Professor Aronszajn's project during 1963-1964.

There was one other important appointment in 1963 although it did not add a new member to the staff: Professor Nachman Aronszajn was appointed to a Summerfield Distinguished Professorship [Aronszajn 2]. He had been tempted to accept a position at the University of Wisconsin, but he finally decided that The University of Kansas offered a better opportunity to do the work he wanted to do than did Wisconsin. Professor Aronszajn argued that "Research Professor" would have been a more appropriate title than the one he received, but Chancellor Wescoe declined to give that title to anyone. Dr. Wescoe feared that the title would suggest to the regents and the legislature that teaching and research could be separated, and that they might be tempted during hard times to reduce their support of research.

There were four resignations in 1964. Professor George Springer (1955-1964) resigned to accept a position at Indiana University. He had been a valuable member of the staff; his work with summer institutes, undergraduate research participation projects, and honors programs had been outstanding. Professor John B. Johnston (1958-1964) resigned to accept a position with the General Electric Company; as I have explained, he left because he had become interested in computer science. Professor Gunther W. Goes (1963-1964) resigned in 1964 to accept a position at Illinois Institute of Technology. Mrs. Carol H. Bassett resigned because her husband had completed the requirements for his Ph.D. degree in English and accepted a position at the University of Pennsylvania.

As a result of the four resignations in 1964 and of rapidly increasing enrollments, there were five new appointments to the staff in the fall of 1964 and there was one visitor. Professor E. Benton Cobb (1964- ), a specialist in statistics, had received his Ph.D. degree from the University of Nebraska in 1964. Professor Philip R. Montgomery (1964- ), a specialist in algebra, had received his Ph.D. degree from Washington University in St. Louis in 1964. Professor Thomas M. Creese (1964- ), a specialist in the theory of functions of a complex variable, had received his Ph.D. degree from the University of California in Berkeley in 1964. Professor Ponnaluri Suryanarayana (1964-1965), a specialist in functional analysis, had received his Ph.D. degree from the University of California in Berkeley in 1964. Mrs. Karin Vantuyl Chess, who was a graduate student in the Department at the time, was appointed to an instructorship to fill the position that had been held by Mrs. Bassett. Finally, James L. Griffith from Australia was a visiting associate professor during 1964-1965; he taught mathematics and participated in the activities of Professor Aronszajn's research project.

The Department lost eight staff members (two of them were visitors) in 1965. Professor J. T. White (1962-1965) resigned to accept a position at Texas Technological College. Joe L. Mott (1963-1965) resigned to accept a position at Florida State University. John A. Pfaltzgraff (1963-1965) resigned to accept a position at Indiana University. P. Suryanarayana (1964-1965) resigned to return to India to rejoin his family there. Mrs. Karin Vantuyl Chess resigned from the instructorship to which she had been appointed in 1964. Haruo Murakami (1963-1965) returned to Japan, and James L. Griffith (1964-1965) returned to Australia.

But the resignation that caused serious difficulties in the Department was that of Professor William R. Scott (1949-1965). His resignation was handled in a manner typical of Scott. About Thanksgiving time, 1964, I encountered him outside the Department office. After asking whether he could speak to me for a moment, he handed me a letter. In the briefest possible manner, it said that he hereby resigned, that he had accepted a position at the University of Utah, and that he had enjoyed his years at The University of Kansas. Professor Scott would make no comment whatever about his new position, and the only comment he would make about The University of Kansas was that he thought it had a good Department of Mathematics. To this day I have no information, but I always assumed that the University of Utah offered him four or five thousand dollars more salary than The University of Kansas was paying him. He deserved more salary, but my efforts to obtain it for him at The University of Kansas had been unsuccessful. Professor Scott was one of the pillars of the Department, and his loss was a severe blow. The rest of the staff was very much upset, and some later resignations resulted from the situation that developed after Scott's resignation. Throughout the 1960's I found appointments and salaries almost impossible to manage. The national salary scale rose faster than salaries were increased in the University. Next year's mathematician (a new appointment) always seemed to demand a higher salary than the University could pay the one appointed this year.

In spite of the large number of resignations in 1965, or perhaps because of it, there were only two new staff members and two visitors in September 1965. Jayanthi Chidambaraswamy, a specialist in number theory, had received his Ph.D. degree from the University of California in Berkeley in 1964 for a thesis written under the supervision of Professor D. H. Lehmer. Mrs. Patricia (Swope) Croat, who had received a master's degree in mathematics from The University of Kansas in 1965, was appointed to an instructorship. Dr. Rolf L. M. Andersson from Sweden was a visiting research associate during 1965-1966, and Professor Charles Ehresmann from the University of Paris was a visiting professor during the spring semester of 1966; both were associated with Professor Aronszajn's research project.

In 1966, Dr. Andersson returned to Sweden, Professor Ehresmann returned to Paris, and three members of the staff resigned. Professor Jayanthi Chidambaraswamy (1965-1966) resigned to accept a position at the University of Toledo, and Professor John H. Harris (1963-1966) resigned to accept a position at Stevens Institute of Technology. The Department suffered a severe loss in the resignation of Professor S. M. Shah (1960-1966); he accepted a position at the University of Kentucky. Professor Shah had been highly successful in his research and as a teacher and a thesis supervisor. He was the third full professor the Department had lost in three years.

After such severe losses by resignation, additions to the staff were required above all else. Thus, in the fall of 1966, there were nine new staff members and two visitors. Professor Thomas K. Boehme was a visiting associate professor during the first semester of 1966-1967 and a visiting scholar on sabbatical leave from the University of California at Santa Barbara during the second semester. He had received his Ph.D. degree from California Institute of Technology in 1960 for a thesis written under the supervision of Professor Arthur Erdélyi. Professor Boehme's research interests were operational calculus and generalized functions. Professor Robert R. Colby (1966-1969), a specialist in algebra, had received his Ph.D. degree from the University of Washington in Seattle in 1966. Professor Edgar A. Rutter, Jr., (1966- ), a specialist in algebra, had received his Ph.D. degree in 1965 from Iowa State University. Professor Mark Mandelker (1966-1969), a specialist on rings of continuous functions, had received his Ph.D. degree in 1966 from the University of Rochester. Professor Richard E. Phillips (1966-1969), a specialist in group theory, had received his Ph.D. degree in 1966 from The University of Kansas. Professor Manfred Breuer (1966-1971), a specialist on geometry and topological algebras, had received his doctor's degree from the University of Bonn, Germany, in 1958. Professor Ronald Jacobowitz (1966-1970), a specialist on algebraic number theory and algebraic topology, had received his Ph.D. degree from Princeton University in 1960. Professor Jack R. Porter (1966- ), a specialist on general topology, received his Ph.D. degree from New Mexico State University in 1966. Professor Robert E. Powell (1966-1969), a specialist on complex analysis, received his Ph.D. degree from Lehigh University in 1966. Professor Milton Rosenberg (1966 to December 1970) had received his Ph.D. degree from Indiana University in 1964 for a thesis written under the supervision of Professor Pesi R. Masani; Professor Rosenberg's fields of interest were analysis, probability, and statistics. Finally, Professor Carl B. Boyer, a member of the faculty of Brooklyn College, was the Rose Morgan Visiting Professor in the fall of 1966; he is well known for his books on the history of mathematics. The manuscript of Professor Boyer's lastest book, *A History of Mathematics*, was typed while he was in Lawrence.

In 1967 Professor Lee M. Sonneborn (1958-1967) resigned to accept a position at Michigan State University. He had been a valuable member of the Department, but he had become discouraged over his progress and advancement in the Department. Also in 1967 Mrs. Patricia (Swope) Croat (1965-1967) resigned from the instructorship which she held. Her husband had completed the requirements for his Ph.D. degree in botany, and they moved to St. Louis.

There were four new additions to the staff in 1967. Professor Robert D. Moyer (1967- ), a specialist on analysis and differential equations, had received his Ph.D. degree from the University of California in Berkeley in 1964; he worked in industry for a short time and taught at Pennsylvania State University before coming to The University of Kansas. Professor James D. Church (1967- ) a specialist on statistics, had received his Ph.D. degree from the University of Nebraska in 1966; he had spent the year 1966-1967 as a visiting assistant professor of Mathematics at the U. S. Army Mathematics Research Center at the University of Wisconsin. Professor Theodore W. Palmer (1967-1970), a specialist on Banach algebras, received his Ph.D. degree from Harvard University in 1966; he was a visiting assistant professor at the University of Wisconsin during 1966-1967. Professor Leonard J. Lipkin (1967-1972), a specialist on the calculus of variations, received his Ph.D. degree from the University of Michigan in 1965 for a thesis written under the supervision of Professor Lamberto Cesari. Professor Lipkin was an instructor at the University of California at Berkeley from 1965 to 1967.

There were no resignations from the staff in 1968, and there were two new appointments in the fall of 1968. Professor James F. McClendon (1968- ), a specialist on algebraic topology, had received his Ph.D. degree from the University of California at Berkeley in 1966; he had been an instructor at Yale University from 1966 to 1968. Professor T. P. Srinivasan (1968- ; on leave from 1969 to January 1972), a specialist on functional analysis who had been educated in India but who had never received a Ph.D. degree, had spent the academic year 1967-1968 at Berkeley writing a book on measure and integration theory with Professor J. L. Kelley.

There were four who resigned from the staff in 1969: they were Colby, Mandelker, Phillips, and Powell. Professor Robert R. Colby (1966-1969) resigned to accept a position at the University of Hawaii. Professor Mark Mandelker (1966-1969) resigned to accept a position at New Mexico State University. Professor Richard E. Phillips (1966-1969) resigned to accept a position at Michigan State University. Professor Robert E. Powell (1966-1969) resigned to accept a position at Kent State University.

There were six new appointments to the staff in 1969; those appointed were Assistant Professor Anger, Cunningham, Hornell, Kabele, Donald L. Stancl; and Instructor Mildred L. Stancl. Professor Frank D. Anger (1969-1970, 1971-1972), a specialist in algebra, received his Ph.D. degree from Cornell University in January 1968; he was an instructor at Massachusetts Institute of Technology from 1967 to 1969. During 1970-1971 he held a visiting position in New Zealand. Professor Robert S. Cunningham (1969-1973), a specialist in ring theory, received his Ph.D. degree from the University of Oregon in 1969. Professor James M. Hornell (1969-1973), a specialist on algebra and algebraic geometry, received his Ph.D. degree from the University of California at Berkeley in 1967; he was an instructor at Stanford University from 1967 to 1969. Professor Thomas G. Kabele (1969-1972), a specialist on algebra, received his Ph.D. degree from Northwestern University in 1969. Professor Donald L. Stancl (1969-1972), a specialist on group representation theory, received his Ph.D. degree from the University of Illinois in 1966; he spent a year at Warwick, England, and two years as an instructor at Princeton University before coming to The University of Kansas. Dr. Mildred L. Stancl (1969-1972), a specialist on topology, received her Ph.D. degree from the University of Illinois in 1969.

Professors Jacobowitz and Palmer resigned at the end of the academic year 1969-1970. Professor Ronald Jacobowitz (1966-1970) resigned and accepted a position at Arizona State University. Professor Theodore W. Palmer (1967-1970) resigned and accepted a position at the University of Oregon.

Five new staff members were appointed to positions in the Department in 1970; they were Professors Brewer, Bunce, Conrad, Deddens, and Mostert. Professor James W. Brewer (1970- ), a specialist on commutative ring theory, received his Ph.D. degree from Florida State University in 1968; he taught at Virginia Polytechnic Institute before coming to The University of Kansas. Professor John W. Bunce (1970- ), a specialist on functional analysis, received his Ph.D. degree from Tulane University in 1969; he held a postdoctoral fellowship at the University of Pennsylvania during 1969-1970. Professor Paul F. Conrad (1970- ), a specialist on algebra and partially ordered structures, received his Ph.D. degree from the University of Illinois in 1951; he was a member of the faculty of Tulane University before he came to The University of Kansas. Professor James A. Deddens (1970- ), a specialist on functional analysis and operator theory, received his Ph.D. degree from Indiana University in 1969; he held a position at the University of Michigan during 1969-1970. Professor Paul S. Mostert (1970- ), a specialist on topological semigroups, transformation groups, and category theory, received his Ph.D. degree from Purdue University in 1953; he also was a member of the faculty at Tulane before he came to Kansas. Professor Mostert became the new Chairman of the Department of Mathematics in the summer of 1970.

The recruiting of senior staff members, assistant instructors, and graduate students was one of my major activities during the 1960's, and it required much time and effort from the entire staff also. Let me describe first the recruiting of mathematicians for the senior staff, that is, mathematicians who had already received their Ph.D. degrees and were candidates for permanent positions on the senior staff. Mathematicians from outside the United States (that is, from Europe, Australia, and Japan) who sought visiting positions for a year or two were accepted on the basis of recommendations submitted for them; it was impossible to have them visit the campus for interviews. But visitors were only a small part of the staff, and most of the recruiting efforts were directed at candidates inside the United States. There was much correspondence involved in locating candidates and in obtaining letters of recommendation for them, because mathematicians were scarce throughout the entire period from 1945 to 1970. (About 1970 there was a dramatic change; positions suddenly became scarce and candidates were plentiful.) There was much work to be done, however, even after candidates were located. Each one was invited to come to the campus for a visit of one or two days to become acquainted with the University, meet the deans and the members of the staff, and give an hour's talk on mathematics (for a fresh Ph.D., the talk was usually an account of the candidate's dissertation). I do not remember a single exception to this procedure during the entire period from 1945 to 1970, and both the University and the Department felt that the time, effort, and money were well spent. The unfavorable image and reputation that Kansas acquired in its early days have persisted to the present time, and many candidates who arrived lukewarm became enthusiastic after they had seen the University. Furthermore, the staff eliminated many candidates who had made a favorable impression up to the time they gave their talk on mathematics.

The recruiting of graduate students and assistant instructors followed a different pattern, because it was not possible to invite any of them to the campus. I wrote to the chairman of departments of mathematics in colleges and universities that did not have graduate schools and asked them to send me the names of students they would recommend for graduate study in mathematics. I usually obtained four or five hundred names of students in this way. I wrote directly to each student, told him or her that he or she had been recommended for graduate study in mathematics, described the program and the financial aid available at Kansas, and sent a complete set of application blanks. Through most of the 1960's, this procedure produced 160 to 175 applications annually. The best applicants received the Department's fellowships and traineeships, and the next group received assistant instructorships. The poorest applicants were denied admission to the graduate school. In most years there were few, if any, graduate students who did not receive some financial support from the Department. For two or three years at the peak of the mathematical boom in the mid-1960's, however, there were as many as twenty-five or thirty who paid their own expenses for graduate study in mathematics.

The Department had an all time high of 132 graduate students in 1966. Of this group, 72 were half-time assistant instructors. Throughout the period from 1945 to 1970, the major share of the Department's financial support for graduate students consisted of the part-time teaching positions supplied by assistant instructorships. In 1967-1968, four of the Department's graduate students were supported by National Aeronautics and Space Administration Predoctoral Training Grants (NASA traineeships), but in 1968-1969 there was only one. In 1967-1968, two graduate students were supported by National Science Foundation Traineeships; in 1968-1969, the number had increased to four. In 1967-1968, six graduate students held National Defense Education Act Title IV Fellowships; in 1968-1969, the number had increased to eleven. In 1967-1968, and also in 1968-1969, five graduate students held research assistantships; throughout the 1960's National

Science Foundation research grants supplied from two to five research assistantships for the Department's graduate students. These figures indicate the nature and extent of the financial support provided by the federal government for the production of mathematicians, especially during the Kennedy race to the moon (1961-1969).

The Department grew to enormous size in the period from 1945 to 1970. In the period from 1890 to 1900 the Department's staff consisted largely of Ephraim Miller, teacher, and Henry Byron Newson, teacher and researcher; the records for 1969-1970, however, list twenty-eight Ph.D. mathematicians on the Department's staff for that year. There were eight professors, eight associate professors, eleven assistant professors, and one Ph.D. instructor. In addition there were seventy-two half-time assistant instructors.

The records show that this staff of 100 instructors gave 16,420 student-hours of instruction per week during the fall semester of 1969. The Department of English was the only department in the University which gave more student-hours of instruction per week than did the Department of Mathematics. The College of Liberal Arts and Sciences and the School of Education were the only two schools in the University that gave more student-hours of instruction per week than did the Department of Mathematics. At the peak of its popularity, the Department of Mathematics had 180 to 190 majors in the junior and senior years in the College; at that time the Department of Mathematics had a larger number of majors than any other department in the College of Liberal Arts and Sciences. At the end of my term as Chairman, the Department's annual budget (exclusive of the Summer Session and research grants of all kinds) amounted to about two-thirds of a million dollars; since only $7,500 of this budget was the Department's maintenace fund (an increase from $250 when I became Chairman), essentially all of the Department's budget was for salaries and a very small hourly payroll for papergraders. One measure of the growth of the state's educational effort (and of inflation!) can be obtained by observing that the Department's budget in 1969-1970 was almost exactly the same as the budget of the entire University for the years 1937-1938 and 1938-1939; for each of these years the legislature appropriated $675,000 for salaries and wages for the entire University.

The number of graduate degrees in mathematics awarded by the University between 1945 and 1970 provides another measure of the size of the Department's operation in this period. The accompanying table shows the number of master's and doctor's degrees awarded in mathematics each year, as recorded in the commencement program for that year. It should be recalled that each master's degree required an expository thesis and each Ph.D. degree required a thesis supervised individually by a member of the staff which produced original research.

I have given several measures of the size of the Department's staff and program; I should now like to give some indications of its quality. The first of these is an account of the Department's undergraduate research participation projects; conducted from 1960 through 1970, they were supported largely by grants from the National Science Foundation. The following account of these undergraduate research participation projects is quoted directly from the proposal to NSF for the 1970 URP project and summarized from the report on this 1970 project.

"The Department of Mathematics of The University of Kansas has long been interested in special programs for its gifted undergraduate students. It has offered special 'honors' sections of its freshman and sophomore courses in calculus and analytic geometry for approximately the top five to ten per cent of the students taking the course. Beginning at least as far back as 1958, the

Table Showing the Number of Master's and Doctor's Degrees in Mathematics, by Years, Awarded by The University of Kansas from 1946 through 1971

| Year | Number of M.A.'s | Number of Ph.D.'s | Year | Number of M.A.'s | Number of Ph.D.'s |
|---|---|---|---|---|---|
| 1946 | - | - | 1961 | 20 | 2 |
| 1947 | - | 1 | 1962 | 19 | 2 |
| 1948 | 7 | - | 1963 | 22 | 3 |
| 1949 | 6 | - | 1964 | 12 | 3 |
| 1950 | 8 | - | 1965 | 27 | 8 |
| 1951 | 5 | 1 | 1966 | 27 | 4 |
| 1952 | 3 | 3 | 1967 | 26 | 8 |
| 1953 | 3 | 2 | 1968 | 19 | 6 |
| 1954 | 2 | 1 | 1969 | 22 | 10 |
| 1955 | 4 | 3 | 1970 | 15 | 2 |
| 1956 | 4 | 4 | 1971 | 5 | 5 |
| 1957 | 6 | 2 | | | |
| 1958 | 5 | 3 | | | |
| 1959 | 16 | - | | | |
| 1960 | 17 | 2 | | | |

most promising of these honor students have been admitted to undergraduate seminars in which the students prepared lectures on selected topics and worked on special problems to develop their problem-solving techniques. In 1960, the Department of Mathematics received its first NSF Undergraduate Research Training grant for six students to work during the summer [*The Graduate Magazine*, 124]. They studied groups of transformations under the supervision of Professors George Springer and Robert Schatten. In the course of their investigations, several interesting and, as far as we know, new theorems were proved concerning the square roots of invertible transformations. The project was extended into the academic year to enable the students to write up their results for publication. The report was published in The University of Kansas student journal *Search* in the spring of 1961.

"During the academic year 1961-1962 the Department of Mathematics received support from a combined NSF Undergraduate Research Participation grant to a number of science departments of the University of Kansas. This NSF grant, supplemented by additional support from a Carnegie Foundation grant, supported six students during the summer of 1961 and the following academic year. Under the supervision of Professors Lee M. Sonneborn and George Springer, they investigated problems in the topology of plane curves. When Professor Springer left on his sabbatical leave in August, 1961, he was replaced by Professor William R. Scott. The problems studied during 1961-1962 were in the field of algebraic projective geometry. In the first phase of this work, a paper by Schnirlmann on the still unsolved problem of inscribing a square in an arbitary Jordan curve was read and the students attempted to solve special cases of this problem. One student published his elegant solution of the problem of inscribing a triangle in a Jordan curve in The University of Kansas student journal *Search* and won a prize for his paper.

"During the summer of 1963, nine students were selected to work with Professors Shah and Springer on the Geometry of the Complex Plane. Eight of these students were undergraduates at the University of Kansas and one was an undergraduate from Baker University in Baldwin, Kansas. Professor Springer worked intensively with the group during the first week of the project to give them an orientation into their work, and Professor Shah met with them weekly thereafter during the remainder of the summer. For the first part of this research program, the students read about linear fractional transformations in various books. Then Professor Shah reported to them about his own recent research related to Steiner's problem and suggested problems for the students to investigate. This work led to a solution, by two members of the group, of a related problem. Their solution was presented at a meeting of the Kansas Section of the Mathematical Association of America in April, 1964, and it was published as follows:

> Dale Brownawell and Victor Goodman. "A Variation of Fermat's Problem". *Mathematics Magazine*, vol. 38 (1965), pp. 267-276.

"During the academic year 1963-1964, Professor Springer was in charge of the undergraduate participation project again. Under his direction, the group engaged first in a study of hyperbolic non-Euclidean geometry and later in a study of a method of estimating Fredholm eigenvalues in circular domains. The students met with Professor Springer in a weekly seminar in which they reported on their reading and research.

"In the summer of 1964, a new feature was introduced into the undergraduate participation project. Six undergraduate students from The University of Kansas were joined by fourteen superior students from neighboring colleges and universities where similar undergraduate research programs were not available. It was immediately obvious that this new feature led to a significant improvement in the program. The 1964 summer seminar was directed jointly by Professors William R. Scott and Joe L. Mott. The subject of this seminar was algebraic number theory, and more specifically an investigation concerning which quadratic number fields have domains of algebraic integers, which are Euclidean, and which are unique factorization domains.

"The weekly seminar in 1964-1965 was conducted by Professor Scott; it treated a number of subjects including continued fractions, game theory, fixed point theorems with applications to differential equations, and limits of derivatives. Although Professor Scott was in charge, Professors Shah, Bradt, and Van Vleck appeared as guest lecturers on some of the topics. There were ten students in the program.

"In the summer of 1965, fifteen students studied problems in Galois theory under the supervision of Professor Scott. Once more the students came partly from The University of Kansas and partly from various colleges and universities in surrounding states, and again the program was considered to be highly successful.

"During the academic year 1965-1966, the participants in the seminar studied universal algebra under the direction of Professor Lee M. Sonneborn. After some preliminary study from *Elements of Modern Algebra* by S. T. Hu, the students undertook the study of P. M. Cohn's *Universal Algebra*. There were nine students in the seminar.

"Professor Sonneborn, the director, obtained the permission of the National Science Foundation to extend the project through the summer of 1966. Professor Sonneborn selected five outstanding students to pursue independent study under the supervision of faculty members; three of the students were supported by the

NSF grant and two by other funds. Two, who worked with Professor Robert D. Adams, completed Fleming's *Functions of Several Variables* and a substantial portion of Halmos' *Finite Dimensional Vector Spaces*, and the other three, who worked with Professor G. Baley Price, read a part of Halmos' book and all of Hochstadt's textbook entitled *Differential Equations*.

"The seminar continued during the academic year 1966-1967 under the supervision of Professor Sonneborn. The principal subject for study was group theory, in augmentation of the modern algebra course in which most of the seminar participants were enrolled concurrently. The topics studied in the seminar included free groups, generators and relations, and automorphism groups of Abelian groups. Some preliminary study of p-groups was included as preparation for the 1967 summer program.

"Group theory was the subject of the NSF-supported Undergraduate Research Participation project in the summer of 1967. Under the direction of Professor Price and the research supervision of Professors L. M. Sonneborn and R. E. Phillips, six students from The University of Kansas were joined by four students from other colleges and universities in Kansas and neighboring states in an intensive study of p-groups and other selected topics in group theory. The seminar was outstandingly successful. Two research papers were written by members of the project. Walter R. Stromquist wrote a paper entitled "A Criterion for Commutativity of Groups". This paper generalizes and simplifies the results in a paper published by Professor John R. Durbin in the *Mathematische Zeitschrift* in 1967. The other paper was published as follows: Kenneth K. Hickin. "A Class of Groups Whose Local Sequence is non-Stationary". *Proceedings of the American Mathematical Society*, vol. 21 (1969), pp. 402-408. It solves a problem proposed by the supervisors as to whether a local operator (in the sense of Kurosh) must become stationary at some finite iteration (the answer is no).

"During the academic year 1967-1968, six students from The University of Kansas attended a weekly seminar conducted by Professor Van Vleck. This activity was supported only by the University. The seminar treated analysis, and, in particular, selected topics from Dieudonne's *Foundations of Modern Analysis* were discussed.

"During the summer of 1968 there were eleven participants in the ten weeks, Undergraduate Research Participation project supported by the National Science Foundation; eight of these were students at The University of Kansas and three came from other universities and colleges. Professor Price was the director of the project, and Professors Porter and Van Vleck were the research supervisors. The project was devoted to a study of multifunctions, selection theorems (both for continuous and measurable selectors), and fixed point theorems (both for single- and multiple-valued functions). Professor Porter conducted a seminar on topology and Professor Van Vleck conducted a seminar on multifunctions and their applications. One paper entitled "Fixed Point Theorems for Condensing Multifunctions" and written by Charles J. Himmelberg, Jack R. Porter, and Fred S. Van Vleck will be published in the *Proceedings of the American Mathematical Society*; this paper was motivated by a problem which arose in the project. Two more published papers may result from the project. The first, by Roger K. Alexander, shows that a topology introduced by E. Michael is indiscrete. The second, by Alexander and Professors Porter and Van Vleck, is a summary of the various definitions of continuity and their characterizing topologies. In addition, Mr. Hickin showed that a contractive multifunction need not have a contractive selector. Finally, Alexander, Hickin, William Homer, and Gary Walls, conducted a literature search and prepared a bibliography of publications on multifunctions and fixed point theorems issued during the past years. The project in the summer of 1968 was an outstanding success.

"The subject of the 1969 summer NSF URP project was near-rings. The project director, Professor Price, with the research supervisors, Professor R. R. Colby and E. A. Rutter, Jr., selected four participants from The University of Kansas and eight from other colleges and universities from a large number of excellent applicants; ten participants received stipends from NSF and two received similar stipends from The University of Kansas. The program included a course on ring theory using McCoy's text entitled *The Theory of Rings* (all exercises were worked), and a seminar on near-rings which comprised 60 per cent of the program. The students presented papers on near-rings in the seminar, and their presentations of advanced topics on near-rings were excellent. Mr. Gayler found a necessary and sufficient condition for a near-ring to be embedded in a division near-ring. Mr. Case simplified and generalized a method used by R. A. Jacobson to construct all near-rings on a group of prime order; he also determined which automorphism subgroups give rise to the same near-rings (up to isomorphisms). Mr. Case's work may result in a publication. Another student, Mr. Baynton, not only found an error in a proof to a theorem but also proved the theorem to be false. The 1969 summer project was highly successful.

"The Department's undergraduate participation projects have involved other features designed to promote the study of mathematics. Cost-of-program allowances have often been used to purchase relevant books, pay initiation and membership fees for the participants to the Mathematical Association of America, and to pay the expenses of the students to sectional and national meetings of the MAA."

The National Science Foundation supported its last Undergraduate Research Participation (URP) project in the Department in the summer of 1970; Professor G. B. Price was the director of this project, and Professors Charles J. Himmelberg and Jack R. Porter were the research supervisors. The NSF grant supported ten students and funds from The University of Kansas supported an eleventh. These eleven students were Jo Ann Brown (junior at Westmar College, Iowa), Peter Andrew Goodsell (junior at the University of Chicago), Charles Lawrence Hall (sophomore at The University of Kansas), Richard Allen Karhuse (sophomore at the University of Missouri at Rolla), Gary David Kruse (junior at Loras College, Iowa), David Lawrence Martin (junior at Colgate University, New York), Diana Gail Pike (junior at The University of Kansas), Nathaniel Dunton Reynolds (junior at The University of Kansas), Harold David Taylor (junior at The University of Kansas), Neil Emory Watson (junior at Louisiana State University at New Orleans), and Nancy Rae Wood (junior at Northeast Missouri State College). The project was divided into three parts: a course in basic general topology, a seminar on the theory of minimal topological spaces, and the presentation of students' research. The portion of the project when students presented their results started with a surprise when one of the students, Mr. Karhuse, immediately characterized minimal P spaces for $P = T_\alpha$, $T_\beta$, $T_{\alpha\beta}$, and $T_{FF}$. Mr. Karhuse's success became a silent call to excel.

Mr. Kenneth K. Hickin, a member of the 1967 and 1968 URP projects, was one of the most successful, in research, of the Department's undergraduates. Mr. Hickin wrote the following paper as part of his research as a participant in the 1968 URP project (Professor Phillips was a member of the staff and a research supervisor of the 1967 URP project):

Kenneth K. Hickin (with Richard E. Phillips). "On Ascending Series of Subgroups in Infinite Groups". *Journal of Algebra*, vol. 16 (1970), October, 1970, no. 2, pp. 153-162.

Mr. Hickin's first published paper, entitled "A Class of Groups Whose Local Sequence is Non-Stationary", has already been listed above. Mr. Hickin wrote a third paper, in collaboration with Dr. John A. Wenzel. Dr. Wenzel wrote a Ph.D. dissertation on group theory and received his Ph.D. degree from The University of Kansas in June 1969; Mr. Hickin generalized a principal result in Dr. Wenzel's dissertation, and he and Dr. Wenzel published the following joint paper.

> Kenneth K. Hickin and John A. Wenzel. "On the Normal Product of *FC*-Nilpotent and *FC*-Hypercentral Groups". *Acta Mathematica Academiae Scientiarum Hungaricae* (Budapest), vol. 22 (1971/72), pp. 355-358.

The Undergraduate Research Participation projects led to publications also by members of the senior staff; the following paper grew out of a problem which arose in the 1968 project.

> Charles J. Himmelberg, Jack R. Porter, and Fred S. Van Vleck. "Fixed Point Theorems for Condensing Multifunctions". *Proceedings of the American Mathematical Society*, vol. 23 (1969), pp. 635-641.

Professors Porter and Van Vleck were the research supervisors in the 1968 URP project, but Professor Himmelberg did not have any formal connection with it.

The following table contains a summary of information about the Department's Undergraduate Research Participation Projects.

| Grant | Period of Grant | Director and Principal Staff |
|---|---|---|
| NSF G-12491 | June 1, 1960 to January 31, 1961 | Professors George Springer and Robert Schatten |
| NSF GE-1937 | June 1, 1962 to October 31, 1964 | Professors George Springer, W. R. Scott, and S. M. Shah |

| | | |
|---|---|---|
| NSF GE-4060 | June 1, 1964 to July 31, 1965 | Professors W. R. Scott, J. L. Mott, R. N. Bradt, S. M. Shah, and F. S. Van Vleck |
| NSF GE-6187 | June 1, 1965 to July 31, 1966 | Professors W. R. Scott, L. M. Sonneborn, R. D. Adams, and G. B. Price |
| NSF GY-2880 | June 1, 1967 to September 30, 1967 | Professors G. B. Price, R. E. Phillips, and L. M. Sonneborn |
| NSF GY-4422 | June 1, 1968 to October 31, 1968 | Professors G. B. Price, J. R. Porter, and F. S. Van Vleck |
| NSF GY-5905 | June 1, 1969 to October 31, 1969 | Professors G. B. Price, R. R. Colby, and E. A. Rutter, Jr. |
| NSF GY-7296 | June 1, 1970 to October 31, 1970 | Professors G. B. Price, Charles J. Himmelberg, and Jack R. Porter |

The success of the Department's teams in the William Lowell Putnam Mathematical Competition is another indication of the quality of the Department's staff and program. The William Lowel Putnam Mathematical Competition is a national competition conducted annually by the Mathematical Association of America for undergraduates. Many of the Department's students entered this competition, but the Department had its greatest success in the twenty-ninth competition, held in 1968. Eight of the Department's students entered the 1968 competition, and the Department designated a team of three consisting of Mr. Douglas A. Hensley, Mr. William D. Homer II, and Mr. Walter R. Stromquist. The University of Kansas team ranked fifth among the 209 teams which competed in the competition. The top five teams were from Massachusetts Institute of Technology, University of Waterloo, University of California at Los Angeles, Michigan State University, and The University of Kansas--in that order. A total of 1398 individuals participated in the competition. Mr. Hensley (with a rank of 30) and Mr. Stromquist (with a rank of 20.5) received honorable mention as individuals. Mr. Homer's rank was 159. Professor Jack R. Porter was the coach of the Department's Putnam competitors and team in 1968.

Eleven students from The University of Kansas competed in the thirtieth annual William Lowell Putnam Mathematical Competition held on December 6, 1969. The University of Kansas team consisted of Mr. Douglas A. Hensley, Mr. Walter R. Stromquist, and Mr. Max M. Wells; it ranked twenty-fifth among the 225 teams which entered the competition. A total of 1501 individuals participated in the competition. Mr. Hensley and Mr. Stromquist (each with a rank of 34.5) received honorable mention as individuals.

Another indication of the quality of the Department's program is the success its students have achieved in graduate schools in other universities. Mr. Homer and Mr. Stromquist (as well as many others) received National Science Foundation Predoctoral Fellowships when they graduated; Mr. Homer entered the Graduate School of Princeton University and Mr. Stromquist went to Harvard University. Mr. Hensley went to the University of Minnesota for graduate study in mathematics. Mr. Homer graduated with a straight A record in all courses; he was the eighth student in the history of the University of Kansas to do so. Mr. Homer is the only student from the Department that Princeton University has accepted since I have been in Lawrence, but many of the Department's graduates have been accepted for graduate study in mathematics by such universities as Harvard, Brown, Cornell, Michigan, Chicago, Wisconsin, Minnesota, Stanford, and the University of California (Berkeley and Los Angeles).

The following are additional indications of merit of the Department's program and staff. Professor Fred S. Van Vleck received the Standard Oil of Indiana Foundation Award of $1,000 on June 2, 1968, for outstanding teaching; Professor Aronszajn accepted an invitation to present a paper at the Colloquium on Nuclear Spaces and Ideals in Operator Algebras which was held in Warsaw, Poland from June 18 to 28, 1969. Professor Manfred Breuer accepted an invitation from Professor Michael F. Atiyah to spend three weeks at Oxford University in March 1969. While he was there, Breuer was engaged in research on Fredholm operators with Professor Atiyah and Professor I. M. Singer from Massachusetts Institute of Technology. Professor G. Baley Price received the Ninth Annual Award for Distinguished Service to Mathematics at a meeting of the Mathematical Association of America held in San Antonio, Texas on January 25, 1970 [Price 20].

Finally, the American Council on Education, in 1964 and 1969, made assessments of quality in graduate education which included ratings of the Department of Mathematics of The University of Kansas. The 1964 assessment was published in 1966 in a book by Allan M. Cartter entitled *An Assessment of Quality in Graduate Education*; the ratings of departments of mathematics were published in the *Notices of the American Mathematical Society*, vol. 13 (1966), no. 94, December, 1966, pp. 978-980. The two tables below contain a summary of the 1964 assessment of the quality of departments of mathematics.

Table 1. Leading Departments, by Rated Quality of Graduate Faculty

| "Distinguished" | Rank | "Strong" | Rank |
|---|---|---|---|
| Harvard | 1 | Wisconsin | 10 |
| California, Berkeley | 2 | Michigan | 11 |
| Princeton | 3 | Illinois | 12 |
| Chicago | 4 | Cornell | 13 |
| M. I. T. | 5 | Cal Tech | 14 |
| Stanford | 6 | Minnesota | 15 |
| Yale | 7 | U.C.L.A. | 16 |
| N. Y. U. | 8 | Washington (Seattle) | 17 |
| Columbia | 9 | Brown | 18 |
| | | Brandeis | 19 |
| | | Johns Hopkins | 20 |
| | | Northwestern | 21 |
| | | Pennsylvania | 22 |
| | | Purdue | 23 |
| | | Virginia | 24 |
| | | Indiana | 25 |

"Good" (7 departments arranged alphabetically)

| | | |
|---|---|---|
| Duke | Ohio State | Rochester |
| Maryland | Rice | Tulane |
| North Carolina | | |

"Adequate plus" (14 departments arranged alphabetically)

| | | |
|---|---|---|
| Carnegie Tech | Notre Dame | Texas |
| Colorado | Oregon | Washington (St. Louis) |
| Iowa (Iowa City) | Penn State | Wayne State |
| Kansas | Southern California | Yeshiva |
| Michigan State | Syracuse | |

Table 2. Leading Departments, by Rated Effectiveness of Graduate Program

| "Extremely attractive" | Rank | "Attractive" | Rank |
|---|---|---|---|
| Princeton | 1 | Cal Tech | 10 |
| Harvard | 2 | Michigan | 10 |
| California, Berkeley | 3 | N. Y. U. | 12 |
| Stanford | 4 | Illinois | 13 |
| M. I. T. | 5 | Washington (Seattle) | 13 |
| Chicago | 6 | Columbia | 15 |
| Yale | 7 | Minnesota | 16 |
| Wisconsin | 8 | Brandeis | 17 |
| Cornell | 9 | Brown | 17 |
| | | U.C.L.A. | 17 |
| | | Northwestern | 20 |

"Acceptable plus" (24 departments arranged alphabetically)

| | | |
|---|---|---|
| Carnegie Tech | North Carolina | Rochester |
| Colorado | Notre Dame | Southern California |
| Duke | Ohio State | Syracuse |
| Indiana | Oregon | Texas |
| Johns Hopkins | Pennsylvania | Tulane |
| Kansas | Pennsylvania State | Virginia |
| Maryland | Purdue | Washington (St. Louis) |
| Michigan State | Rice | Yeshiva |

The 1969 assessment was published in 1971 in a book entitled *A Rating of Graduate Programs* by Kenneth D. Roose and Charles J. Anderson; the ratings of departments of mathematics were published in the *Notices of the American*

*Mathematical Society*, vol. 18 (1971), no. 128, February, 1971, pp. 338-340. The leading institutions, by rated effectiveness of doctoral program, were listed as follows (a) ten institutions with scores in the range 2.0-3.0 were listed in rank order; (b) fifteen institutions with scores in the range 1.5-1.9 were listed in rank order; (c) thirty-six institutions, including The University of Kansas, with scores in the range 0.8-1.4 were listed alphabetically. The leading institutions, by rated quality of graduate faculty, were listed in three categories as follows: (a) twenty-seven institutions, with scores in the 3.0-5.0 range, were listed in rank order; (b) seventeen institutions, with scores in the 2.5-2.9 range, were listed in alphabetical order; and (c) twenty-one institutions, including The University of Kansas, with scores in the 2.0-2.4 range, were listed in alphabetical order. The 1969 assessment did not find any significant evidence of an improvement over 1964 in the quality of the graduate program or of the graduate faculty of the Department of Mathematics of The University of Kansas.

The Department of Mathematics did not have a secretary until after World War II; the addition of a secretary to the Department's staff was one of the changes that accompanied the expanding enrollments caused by the return of the GI veterans. Before World War II the Department's staff and operations were stable, the University's budget was small, and all activity was at a low level. When I became Associate Secretary of the American Mathematical Society in 1946, the AMS supplied some part-time secretarial help for my work for the Society. About the same time, Professor Smith, Chairman of the Department, obtained a full-time secretary for the Department, and the Department has had one or more full-time secretaries since that time. It would be nearly impossible now to obtain a complete list of all of those who have served the Department; almost without exception they have been student's wives, and they have held their positions from one semester to three years. Two of those who are remembered from the 1950's are Mrs. Lois Slaymaker and Mrs. Naomi Patton (Mrs. Peter C. Patton). The record shows that the following worked as secretaries in the office of the Department of Mathematics between 1960 and 1970: Joy Kathleen Matthews (January 4, 1960, to June 1, 1962, with two leaves); Miss Joyce Thornburg (Mrs. Joyce M. Hiatt) (1961-1962); Mrs. Velma G. Scafe (1962-1963); Mrs. Mary Jane Schnack (1963-1966); Mrs. Waleah L. Albright (1963-1964); Mrs. Joyce G. Johntz (June 15, 1964 to April 4, 1965); Mrs. Mary A. Womble (spring 1965 through 1965-1966); Mrs. Karen H. Kullman (1965-1966 through fall 1966); Mrs. Treva C. Phillips (1966-1968); Mrs. Jan L. Hensleigh (spring 1967, 1967-1968, and fall 1968); Mrs. Mary L. Wilson (spring 1967 through 1967-1968); Mrs. Janet S. Lorch (1968-1970); Mrs. Juanita J. Blackwell (fall 1968); Miss Candace R. Crawford (spring 1969); Mrs. Muriel K. Godbout (spring 1969 through 1969-1970); and Mrs. Kathie J. Fundis (1969-1970). As this record shows, the Department has regularly had three secretaries since 1965.

Professor Aronszajn's research project had its own secretary. Mrs. Aronszajn, an excellent secretary and typist of mathematical manuscripts, served as the secretary for the project from 1951 until about 1967, but she began to withdraw from her secretarial duties about 1964. Others who have served as secretary to Professor Aronszajn's project have been Cheryl Anderson (1964-1965); Carole A. Weeks (1965-1968); and Wilma Cromwell (1968- ).

During much of the period from 1951 to 1970, the Department's staff included an assistant to the chairman. Each of the assistants to the chairman was an instructor in mathematics who taught at least one course, and who provided assistance with the administrative duties in the office of the Department.

Miss Frances Lee Wolfe, who received her A.B. degree from The Woman's College of The University of North Carolina in 1947, was the Department's first assistant to the chairman. When she graduated, The Woman's College awarded her a scholarship for graduate work in mathematics; she entered the Graduate School of The University of Kansas in September 1947, and she received her master's degree in June 1949. Miss Wolfe's master's thesis, written under my supervision and entitled "An Introduction to Fourier Series", concluded with the Fourier series solution of the Problem of Dido. Miss Wolfe was one of the Department's instructors from 1949 to 1951, when she returned to The Woman's College of The University of North Carolina; during 1951-1952 she was an instructor in mathematics there and from 1952 to 1956 she was assistant to the chancellor. In September 1956, she returned to The University of Kansas as an instructor in mathematics and assistant to the chairman. She was assistant director of the Department's NSF summer institutes in 1957 and 1958. Miss Wolfe was an excellent teacher and a modest person who possessed mathematical ability, tact, good taste, sound judgment, and administrative skill. Miss Wolfe married James C. Lillo on August 16, 1958; he was an assistant professor in the Department at the time. She resigned at the end of February 1959.

Miss Shirley Temple Loeven received the degree of Bachelor of Science in Education from Central Missouri State College in Warrensburg in May 1956. She began graduate work in mathematics at The University of Kansas in September 1956, and she served as a half-time assistant instructor from 1956 to 1959. She completed the requirements for her master's degree in December 1958. Miss Loeven had worked for three years as a student secretary in the office of the Dean of Administration and Instruction at Central Missouri State College, and during 1959-1960--when I was on leave and Professor Scott was acting chairman--she was a full-time instructor and assistant to the chairman. The second one to hold this position, she was highly successful as a student, teacher, and administrative assistant, and her services were much appreciated by the Department. In 1957 Miss Loeven married Charles Raymond Deeter, a graduate student in the Department at that time. Mr. Deeter received his Ph.D. degree in mathematics in 1963, and he is now a professor in Texas Christian University in Fort Worth, Texas.

Carol Hoffer Bassett (Mrs. Charles W. Bassett) was the Department's third assistant to the chairman. In a letter which she wrote on April 16, 1958, she described her background as follows.

> I received an A. B. degree in June, 1953 and an M. A. degree in June, 1955--both degrees from the University of South Dakota. My undergraduate major was mathematics with minors in education, German, and home economics. My graduate major was mathematics and my minor education. I was graduated *cum laude* and was elected to Phi Beta Kappa. My master's thesis was titled "On the Mathematical Approach to Cryptanalysis."
>
> The academic year 1953-54 I taught high school mathematics in Rock Rapids, Iowa, in a high school of some 300 students. The following year I held a teaching assistantship while attending graduate school. During the year 1955-56 I was an instructor at Iowa State College where I taught courses through the second quarter of calculus. In the fall of 1956 [September 15, 1956] I was married and since my husband's tour of duty has been at Fort Riley, I applied for and secured an instructorship at Kansas State and am completing the third semester of teaching there.

Mr. and Mrs. Bassett moved to Lawrence in September 1958, and Mr. Bassett began his graduate studies for a Ph.D. degree in English. Mrs. Bassett served as an assistant instructor in mathematics during the fall semester of 1959, and in September 1960, she was appointed instructor in mathematics and assistant to the chairman; she held this position until the end of June 1964. Mrs. Bassett (as a letter of recommendation said) was "a small, neatly dressed, vivacious, petite individual", but she was also an excellent teacher, a skillful and forceful administrator, and a manager who maintained firm control over the Department's office. Mrs. Bassett served as the assistant director of the Department's NSF summer institutes in 1961, 1962, 1963, and 1964. Mr. Bassett obtained his Ph.D. degree in 1964 and accepted a position as an instructor in English at the University of Pennsylvania.

Mrs. Karin Vantuyl Chess held the position as instructor in mathematics and assistant to the chairman during 1964-1965. She received the degree of B.S. in Business and Business Administration from The University of Kansas in February 1962. Her progress in mathematics was exceptionally rapid; although she took the first course in calculus in the fall semester of 1961, she completed all requirements for her master's degree in mathematics in August 1964. Her master's thesis, entitled "Shenkman's Derivation Tower Theorem for Lie Algebras", was supervised by Professor Sonneborn. In the fall semester of 1963 she was an assistant on the NSF project to develop Mathematics 11 and 12 and to write textbooks for them; she was an assistant instructor in the spring semesters of 1964 and 1966 and during the academic years 1966-1967 and 1967-1968. Mrs. Chess completed the requirements for her Ph.D. degree in July 1968; her Ph.D. dissertation, entitled "Direct Sums and Normal Systems", was supervised by Professor Richard E. Phillips. During 1968-1969, Mrs. Chess was a full-time instructor in mathematics; she was an excellent teacher as well as a good mathematician. Mr. Chess completed the requirements for his Ph.D. degree in psychology in 1969, and both Mr. and Mrs. Chess accepted positions at Wisconsin State College at Eau Claire in September 1969.

The Department had no Assistant to the Chairman during 1965-1966 and during the three years 1967-1970; the work in the Department's office was carried on by the Chairman, the Associate Chairman (Professor Bradt), and the three secretaries. Mrs. Patricia R. Croat held the position of Instructor in Mathematics and

Assistant to the Chairman during 1966-1967; she was the fifth and last assistant to the Chairman in the period 1945-1970. One of Sister Helen Sullivan's students, Miss Patricia Ruth Swope received her B.A. degree from Mount St. Scholastica College in Atchison in May, 1963. Beginning on June 1, 1963, she was a research assistant on the NSF project to develop Mathematics 11 and 12; she worked full-time for three months in the summer of 1963, a small part-time in the spring semester of 1964, full-time for slightly more than two months in the summer of 1964, and two and one-half months in the summer of 1965. Her contributions on this project were invaluable; she knew mathematics and typing, and she quickly learned to type mathematics. In the summer of 1963 she was the project's typist; she typed the final copy for the two volumes entitled *An Introduction to Mathematics*. The final copy for these two volumes alone amounted to 796 pages of typing. During the summer of 1964 she typed the final copy of *Linear Equations and Matrices* for Professors Johnston, Price, and Van Vleck; during the summer of 1966 she typed the final copy of *Sets, Functions, and Probability* and helped in the preparation of the answers to the exercises. Miss Swope taught one course during the spring of 1964; she was a half-time assistant instructor during 1964-1965; and she was a full time instructor during 1965-1966. As stated above, Mrs. Croat held the position of Instructor in Mathematics and Assistant to the Chairman during 1966-1967. She was an excellent teacher, typist, and administrative assistant. In July 1965, Miss Swope completed the requirements for her master's degree; her thesis, entitled "The Distribution of Totatives", was supervised by Professor McCarthy. On September 4, 1965, Miss Swope married Mr. Thomas Bernard Croat; he received his Ph.D. degree in botany in 1967 and they moved to St. Louis.

Professor Bradt was appointed Associate Chairman of the Department of Mathematics in 1965 and Chairman in January 1975.

The United States won the race to the moon, for on Sunday, July 20, 1969, the U. S. spacecraft Apollo 11 made a soft landing and Neil A. Armstrong became the first man to walk on the surface of the moon. The nation had succeeded in its efforts to produce mathematicians, scientists, and engineers. Furthermore, Appollo 11 had proved that Dr. Richard Porter's prediction, namely, that the United States could send a man to the moon before 1980, was an accurate one [Porter 4; *University Daily Kansan* 2].

But the United States had other problems besides the production of mathematicians, scientists, and engineers and the race to beat the Russians to the moon; a talk Dr. Porter gave at commencement in June 1951 seems to contain ominous forebodings of some of these other problems. In his talk entitled "A Challenge to Education", Dr. Porter urged educators to teach morality and social responsibility [Porter 2].

Throughout the 1960's there was racial strife, and after 1965 the Vietnam War became a major conflict. The Department of Mathematics had trouble again maintaining a staff of assistant instructors because so many of the graduate students were drafted into the Army. Opposition to the Vietnam War led to widespread and violent attacks on ROTC units in many universities. Demonstrators, including some students and faculty members, took over the football field in Memorial Stadium on Friday, May 9, 1969, and prevented the Chancellor's ROTC Review from being held [*University Daily Kansan* 9]. In December 1968, I had been asked to serve as Chairman of the Senate Committee to review the ROTC program in The University of Kansas; the Senate Committee presented its report at the end of October 1969 [*University Daily Kansan* 4]. With some difficulty, the University has been able to continue its three ROTC units. On Monday, April 20, 1970, someone set fire to the Kansas Memorial Union and burned the roof off of the ballroom [*University Daily Kansan* 5]. There was genuine alarm in the University and in the city; a curfew was imposed for several nights, and Dean Heller asked department chairmen to recruit staff members to mount a fire watch in University buildings [*University Daily Kansan* 6]. On Thursday, April 30, 1970, President Nixon announced that United States troops had invaded Cambodia [*University Daily Kansan* 7]. Chaos and violence erupted on university campuses, and four students were killed at Kent State University by the Ohio National Guard on Monday, May 4, 1970 [*University Daily Kansan* 8]. The school year ended in uncertainty, protest, and utter confusion.

My term as Chairman of the Department of Mathematics came to an end on June 30, 1970.

The Supplemental Volume contains additional information about the Department for the period 1945-1970; more precisely, it contains the following: (a) a list, in the order of appointment, of all members of the Department's staff [S, ch. 5, sec. 3]; (b) a list, by years, of the 295 students who received the degree of Master of Arts [S, ch. 5, sec. 4]; and (c) a list, by years, of the 70 students who received the degree of Doctor of Philosophy [S, ch. 5, sec. 5].

## Chapter 6

## The Library

## 1866-1970

From the earliest times down to the present both the faculty and the administration of The University of Kansas have emphasized the importance of the University Library. For example, the first librarian was elected on March 21, 1865, but the first faculty members were not elected until July 19, 1866, and the first session opened on September 12, 1866 [Sterling 1]. Furthermore, 26 of the 198 pages in Sterling's *Quarter-Centennial History of The University of Kansas* are devoted to a history of the library. In modern times, Chancellor Franklin Murphy placed special emphasis--and with remarkable success--on the development of the library [*The Graduate Magazine* 123, 128, 129, 130, 131, 133, 134, 135]. As for the Department of Mathematics, its most important possessions are its staff (its faculty members), its students, and its library. And thus it seems altogether fitting that this history of the Department of Mathematics of The University of Kansas should contain a chapter on the history of the library.

Carrie M. Watson, in her history of the library, described the elections of the first librarians as follows [Sterling 1, p. 104]:

> It is with gratification that we find that the library was a part of the original plan of the University of Kansas. On March 21, 1865, the first Board of Regents elected one of its members, J. S. Emery, librarian. He was reelected on December 6, 1865, and again on July 18, 1866. These elections, as a matter of fact, occurred before the opening of the University, as the first faculty and students did not meet for work until September 12, 1866. J. S. Emery was librarian until 1868. Another Regent, W. C. Tenney, received the appointment from 1868 to 1869. The charge of the library then passed from the Regents to the Faculty. Frank H. Snow, Professor of Natural History, was

elected librarian December 1, 1869, and reelected December 7, 1870.

In spite of this commendable emphasis on librarians, the library itself developed very slowly. On September 13, 1866, Professor Snow described North College (the University's only building) in a letter to a friend in the East [Hyder 1, p. 106; Sterling 1, p. 105]:

> In the third story is the chapel, which is a beautiful room and occupies the whole northern half of the floor, and two smaller rooms are set aside for library and museum. The latter are both empty now, except that there are a few Congressional reports in the one and three or four geological specimens of our own collecting in the other.

North College had a basement and two floors; the library was the southwest room on what was usually called the second floor. In his annual report on August 7, 1867, Chancellor Oliver recommended that the University buy the library of former President Tappan of the University of Michigan, but nothing was done about this recommendation [Hyder 1, p. 202; Sterling 1, p. 107]. Carrie M. Watson reported, however, that later, while Snow was librarian, the University made its first purchases of books for the library [Sterling 1, pp. 107-108].

> We learn from the minutes of the Board of Regents for August 23, 1871, that the committee reported the purchase from John Speer, of Lawrence, of thirteen volumes of the *United States Pacific Survey*. These volumes cost $50. This was the first addition to the library by purchase. In 1873, the expenditures were $220.30 for books of reference.

The library in North College contained the books that had been bought or donated and also a number of Chancellor Fraser's personal books. The advanced students and faculty knew about and used this small collection, but for the great majority of students there was no library.

While Professor Snow was still University librarian, the library moved from North College to the newly completed Fraser Hall; the move is described by Carrie M. Watson as follows [Sterling 1, p. 112]:

> When the removal of the entire University from the old building to the new one took place, in 1872, the mythical nucleus was arranged on shelves in room No. 4, which is now the university reception room. The use of this room was given to the senior classes. Further than adding to their pride, the members of the class gained little else from the advantage. The library experience of the students of this time was mostly confined to the city library and the libraries of the professors.

Chancellor Fraser emphasized the need for a library in the strongest possible terms in his report of the Department of Mental and Moral Philosophy in 1873; he wrote [Sterling 1, p. 108]:

> The books needed by the students are at present furnished out of my private library. Other professors in the institution likewise give to their students the use of books which are not to be found in the very limited and defective library belonging to the University. Without an adequate supply of good books, bearing on the subjects of text books, the student cannot be trained to habits and methods of critical literary and philosophical research. Narrowness, superficiality and dogmatism are almost sure to be results of the method of instruction that limits the student's knowledge of a subject to the contents of a single book. In common with the other members of the Faculty, I feel that my instructions are narrowed in their range and impaired in their usefulness from lack of books by the best authors on the subjects taught in my department. A library is as essential to thorough instruction in literature and philosophy as apparatus is to the laboratory work in chemistry and physics.

Chancellor Fraser accompanied his recommendation with action, for in 1873 the faculty and regents requested an appropriation of $3,000 from the legislature for books for the library. The full amount was not appropriated, but the legislature did grant $1,500 exclusively for the purchase of books. Since the library had relied largely on gifts for its expansion up to this time, the appropriation of $1,500 in 1873 marks the beginning of a determined effort to develop the University library [Sterling 1, p. 112]. Carrie M. Watson gives a table which shows all appropriations for the library from the first $50, for the purchase of the thirteen volumes of the *United States Pacific Survey* in 1871, to $5,000 (in 1889) and $2,500 (in 1890) [Sterling 1].

Professor Snow resigned as librarian on September 3, 1873, and Byron C. Smith, Professor of Greek, became the University librarian. Miss Watson reported two items of interest about Professor Smith's librarianship.

> The first list of books was made in 1874, in manuscript form, by Charles S. Gleed, now a Regent of the University, but at that time a student. It was made for Prof. Byron C. Smith, who was the librarian [Sterling 1, p. 120].
>
> Prof. Byron C. Smith reported as librarian in 1874 that there were less than one thousand volumes. But from that time the growth of the library was more apparent [Sterling 1, p. 109].

As has been recounted in the first chapter of this history, 1874 was a year of turmoil and many changes. After a quarrel with the faculty and the Board of Regents, John Fraser resigned as chancellor and was replaced by the Reverend Dr. James Marvin. Also, Byron Caldwell Smith left the University at the end of 1874 [Hyder 1, pp. 134-138]. Finally, in the closing days of Chancellor Fraser's administration, Ephraim Miller was appointed Assistant Professor of Mathematics. Professor Miller's abilities and talents were recognized immediately, for on January 1, 1875, he became the University librarian; he served in this position for twelve years. Ephraim Miller was the University's first important librarian; he made important contributions to the development of the library. Since Miller's contributions have received little attention from the University's historians, a full account of them will be given here.

Chancellor Marvin began immediately to urge the needs of the library. In his Chancellor's Report to the Board of Regents in 1875 he wrote:

> Next to finished halls the institution most needs books. Thus far the works procured have been well selected. These are in almost daily use, and yet each professor finds himself constantly confronted with inquiries for information, for which he has not adequate reference. Such works as few private collections in a new country can afford, and fewer still would be willing to lend, are in constant demand. Better far for both teacher and student, that the latter be taught how and where to secure extra knowledge for himself than to depend upon his instructors for more gleanings. Our library yet needs Cyclopedias, Gazetteers, standard works of history, biography, and philosophy; practical works on agriculture, commerce, national economy and jurisprudence. Heretofore very few of the valuable scientific and literary magazines of our own country, and none of the European, have been at the command of our students. As we would not send forth from our halls fresh additions to the armies of mere book worms, we should furnish our pupils with the means of keeping in contact with the living world. No other means can prove so effective in doing this as communion with the great thinkers, as seen in their best books, in their treatment of the living issues of to-day. How much better such literature in our schools than the trash our children often buy so cheaply and read so dearly! See report of Librarian.

Unfortunately, the librarian's report for 1875 is not available. Chancellor Marvin returned to the needs of the library in his report to the Board of Regents in November 1876. He wrote:

Next to efficient teachers in a University is a well-selected library. This fact, so well known to educators, cannot be too strongly emphasized. Students, to be thinkers, must read. The curse of much popular literature is, that there is in it so much reading, and so little thinking. Our library should furnish the opposite style of literature, and secure its popularity by furnishing appetites, made keen in the class-room, with the proper food for thought. Now the private library of each professor, and the public library of the city, and even the book stores, are taxed to furnish information which our students seek in vain from our loan library. For over three hundred students we have one Webster's and one Worchester's dictionary, one set of Chanber's Cyclopedia, and some other reference books in like proportion. The great American cyclopedias, the best histories by English and American authors, comprehensive works on general literature and philosophy, and standard works on natural science, are either represented by a few stray volumes or entirely wanting. Many of these books are too expensive to be procured by teachers on low salaries, or, when bought, are too precious to be placed beyond their reach in a common stock for public use. On this and several other needs of the institution, permit me to call your attention to the memorial of the Faculty and to the Librarian's report.

In "the memorial of the Faculty", the members of the faculty added their pleas for help to those of the chancellor and librarian; on November 10, 1876, Professor D. H. Robinson, Secretary of the Faculty, wrote to the Board of Regents as follows.

Gentlemen: The members of the Faculty respectfully urge upon your attention the pressing need of additions to the University library.

For the purposes of higher education, not only instructors and apparatus are required, but a well-filled library is equally essential. The lack of such a library is felt to be the greatest deficiency in the equipment of the University.

At the present time, aside from the Congressional and other public documents which have been contributed, there are scarcely one thousand volumes in the college library, while Michigan University, with a library of twenty-five thousand volumes, devotes $2,000 annually to its increase.

We believe that the youth of Kansas, now here preparing for future usefulness, are deserving of a much better library.

> We therefore respectfully suggest $3,000 as an annual appropriation for this purpose, to be continued until the more urgent needs of the library are supplied.

The librarian's report to which Chancellor Marvin referred was written by Ephraim Miller and dated November 15, 1876; it reads thus:

> Gentlemen: During the past year, there have been no additions to the Library, except the usual public documents from the various departments at Washington, D. C., a few volumes on Pedagogy, some donations, and a loan from the Kansas State Library, consisting of thirty-four volumes of American State Papers and Archives.
>
> There are in the University Library, the following, viz.:

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|---|---|
| Volumes of History | 160 |
| Volumes of English literature, poetry and philology | 146 |
| Volumes of French and German | 118 |
| Volumes of Latin and Greek | 193 |
| Volumes of metaphysics, political economy, etc | 84 |
| Volumes of biography, theology, etc | 124 |
| Volumes of mathematics | 103 |
| Volumes of astronomy, engineering, and art | 129 |
| Volumes of chemistry, physics and natural history | 190 |
| Volumes of miscellaneous works | 72 |
| Volumes of scientific monthlies (unbound) | 100 |
| Volumes of public documents | 1,100 |
| Total number of volumes | 2,519 |

> *The great want of the University is books.* Students are constantly asking for books that the Library does not contain. A large and well-selected assortment, covering the entire domain of human knowledge, is now, more than ever, required. We need the latest and the best, without which a very important arm of the University is paralyzed, and hundreds of minds seriously retarded in their investigations. Omitting the 1,100 public documents in the above list, I am confident that at least one-third of the remaining 1,419 volumes are obsolete and of no practical value to students in search of information relating to their several departments of study.

As Miss Watson pointed out in her history, the University library was located in room No. 4 of Fraser Hall, a room to which only members of the senior class had access. For many reasons the faculty was becoming increasingly insistent that an adequate library be provided; the faculty minutes for November 2, 1876, state that "a com[mittee] was appointed to devise a plan to organize a reading room". The minutes for December 7, 1876, state that the "Com[mittee] on Reading Room reported that it was not expedient to organize a Reading Room at present". These efforts led to success the following year, however, for the minutes in the *Journal of the Board of Regents* for a meeting held on June 12, 1877, record the following action: "Voted that the Library be placed in room C. on the 1st floor, and that substantial shelving be provided." The location of room C and the library are shown on a floor plan of Fraser Hall which was published in several of the University catalogs (see, for example, the catalog for 1881-1882). The minutes of a meeting of the Board of Regents held on November 22, 1877, contain the following report:

> The Chancellor reported, on the employment of clerk in his office & in the Library as authorized by the Board, that he had employed Mr. Gleed at 25 cts. per hour, and that monitors had been employed in the Library from among the students at 10 cts. per hour for four hours a day--the whole expense having been $5. per week.

Miss Carrie M. Watson, writing in 1891, described the library as it was installed in room C [Sterling 1, pp. 112-113].

> It was not until September, 1877, that the books were transferred to a room which had been fitted up with alcoves for the books and tables for the readers. The library was now for the first time thrown open to all the students. Here the library started out in a library fashion, although upon a ludicrously small scale. It was in the west room of the south wing, on the first floor, No. 14--the room now used by the English Department. There were then 2,519 volumes. The room was open from 9 A.M. to 1 P.M. The librarian was occupied with his classes, so the first year the room was under the care of four monitors, one student for each hour. But the next year it was found desirable to have one person to take charge of the room, to keep order, and to issue books. Carrie M. Watson was selected to assist Prof. Miller in this matter. Students could use this room as a reading

> room. They had access to the shelves, and they were permitted to draw one volume at a time for home use. The book could not be kept longer than three weeks without renewal. This was the beginning of the present practice.

But the establishment of the library in room C of Fraser Hall did not solve the library problem, for much remained to be done. The minutes of a meeting of the Board of Regents held on November 22, 1877, state that "it was voted that the Chancellor be authorized to draw from the $300. already appropriated from the Genl Fund for clerical labor such sums as may be necessary for cataloguing the Library". This action probably initiated the work that led to the first printed list of books, issued by Librarian Ephraim Miller in 1880 [Sterling 1, p. 120]. The minutes of a meeting of the Board of Regents held on April 4, 1878, contain the following record:

> On suggestion of Regent Hershfield the Faculty were invited to meet with the Board. The following Professors responded immediately to the invitation: Profs. Snow, Bardwell, Miller, Canfield, Schlegel, Morrow and Wickersham.
>
> Suggestions were made by members of the faculty, relating to additions to the library.
>
> On motion of Regent Wilson it was voted that the members of the Faculty be requested to furnish a committee on Library with a list of books which they would recommend as additions to the Library and report the same at the June meeting.

The records show that Professor Miller was a working librarian and not merely a faculty figurehead. The minutes of a meeting of the Board of Regents held on April 5, 1882, state: "*Voted*, that an appropriation of $75.00 be made to Prof. Miller from General Fund to prepare an index of the Library". The following extract from an editorial in the September 1882 number of the *Kansas Review* describes the status of the University library and Professor Miller's efforts to index it.

> Prof. Miller has been in the city nearly all summer hard at work re-arranging and indexing the University library. With great pains he has gone through the whole library, volume by volume, and made a thorough and comprehensive index, so that hereafter the student will be spared much time and trouble in seeking after desired information. The card system which is now generally used in colleges and universities, the Professor has decided to adopt and accordingly will prosecute the work as fast as possible during the coming year. . . .
>
> Upon the upper shelves of each alcove are placed the Proceedings of Congress and miscellaneous and unclassified books numbering 1,853 volumes. During the last two years, from June 1880, to June 1882, 1,637 volumes were added, and during the same time 2,047 volumes were taken from the library by students and professors. When it is remembered that many students did a great deal of their reading in the library it will be seen that there has been a lively interest in this direction. The library has risen very much in importance and usefulness during the past few years. All the books have been selected with great care, and it now constitutes as the professor well says, "a good working educational apparatus, the nucleus of one of the best libraries in the country".

The editorial stated that the library contained five alcoves and 6,000 volumes. Finally, Professor Miller became a paid librarian; the minutes of a meeting of the Board of Regents held November 20, 1883, contain this record: "Moved that the sum of $100 be appropriated and paid to Prof. Miller as compensation for his services as Librarian for the year ending June 30, -84. *Carried*."

Librarian Miller, in his annual reports to the Board of Regents, continued to describe the state of the library and to urge the creation of a really first-class library for the University. The following is Miller's librarian's report for 1884.

> The total number of books in the library at the present time is 6,500 volumes. The arrangement is nearly the same as stated in my last report.

While it is a matter of regret that the increase has been but very little, yet there is cause for thankfulness that the library has been used by both professors and students as it never was before. Books on literature, science and art have been in constant use, and the results are shown in greater breadth of culture and fitness for work on the part of professors, and a better knowledge of what books to read, and how to read them, on the part of students. The library is in the best sense of the term a workshop. No day passes that does not show at least two hundred students hard at work, seeking information of some kind. Difficulties, however, block the way to complete success, as the library is at present situated. The first is that the room now occupied is too small, being used not only for its special book purposes, but also as a reading room for newspapers and magazines. The result is a most uncomfortable condition of things oftentimes.

Another difficulty is the meager appropriation for supplying new books. To meet the demand that is made almost every day for what is newest and best, there should be expended, each of the two coming years, for books on--

| | |
|---|---|
| Mental and Moral Science | $ 200 |
| Natural History | 200 |
| Latin and Literature | 150 |
| Mathematics | 150 |
| History and Political Science | 400 |
| Greek and Literature | 150 |
| Educational subjects | 100 |
| English Literature | 400 |
| German and French | 200 |
| Civil Engineering | 150 |
| Chemistry, &c | 200 |
| Physics and Astronomy | 200 |
| Miscellaneous | 300 |
| Total | $2,800 |

This amount would increase the value of the library a hundred fold, and yet fall far short of its actual necessities. About $200 more should be added to the above for the purchase of literary and scientific magazines, for the press of both Europe and America is teeming with the productions of the best brains of two continents, and it is the duty of the University to keep abreast of them, else we must go to the wall. The University of California, not so old an institution as that of Kansas, has a library of over 23,000 volumes. The University of Michigan has upon its shelves 40,000 volumes, and since 1877 has increased the number annually by about 3,000 volumes. The University of Kansas, eighteen years old, has 6,500 volumes. Just think of it! The State of Kansas, the best agricultural State in the Union, baptized in blood, and forever consecrated to freedom and intelligence, with a population of 1,200,000 people--is it not the best thing that this proud and prosperous State can do that she provide the means whereby her citizens may become wiser? "The noblest thing in all human performance is to make men better. One way to make them better is to make them wiser." We need more books here to help the student answer the questions of his instructors, and also to help him answer those questions which no lips utter and no fingers write, but which come thronging to him from within and without as the boundaries of his knowledge widen.

Nowadays all subjects of thought and investigation must come to a scientific status before they yield any value to men, and so no library can lay claim to efficiency, so long as a subject-catalogue, an authors' catalogue, &c., do not constitute a leading part in rendering bibliography a study necessary to every scholar. Therefore, along with the other suggestions made, this one is offered, that an indexed card catalogue be provided for as soon as possible.

Finally, there should be one great library in Kansas. Its natural location is at the State University, where at no very remote time may be found a bibliographical center that shall be the pride of every Kansan, in secure quarters, under proper guardians--"men fitted by nature and by training to guide the growth of such a library and make it symmetrical". Are not the times auspicious for pushing an enterprise that is fraught with so many potential blessings to the young men and women of Kansas?

Chancellor Lippincott commented to the Board of Regents on this 1884 librarian's report as follows.

The Librarian's report shows fairly and forcibly the present condition and urgent needs of the University library. This is one of the most important adjuncts of our work. It is in constant use by both professors and students, and contributes largely to the educating influence of the UNIVERSITY. The library should undoubtedly be supplied with the standard works in all the great departments of human learning, but it is no less true that there should be an immediate and large increase of the library fund. A fire-proof library hall should be erected in the near future, and furnished with all the appliances and conveniences of the best modern libraries.

The *Journal of the Board of Regents* shows that the library received continuing attention. For example, the minutes of their meeting held on September 30, 1884, state that "the Chancellor was empowered to employ Mr. Tyler (at a salary not to exceed $200--) to index the Library". On January 27, 1885, the regents added

$75 to the amount already appropriated for indexing the library. The *Journal of the Board of Regents* shows that on June 8, 1885, "On motion, Prof. Miller was employed at the rate of $100 per month for July and August, to continue the work of indexing the Library". There is reason to believe, however, that Ephraim Miller's forthrightness and vision in urging the development of a first-class library for the University were a greater service than his indexing of the Library. Miller's biennial librarian's report to the Board of Regents in 1885 [S, ch. 6, sec. 1] reads in part:

> In my last report I recommended that three thousand dollars a year be appropriated for the purchase of books. That recommendation is herewith repeated. . . . Is that sum too much? The question should rather be, Why is it so little? What is a university without a library? Or, of what use is a library when it does not contain *some* of the books that are needed every day? I hope this matter may be pressed to a successful issue.
>
> It is a matter of supreme moment to the University and its friends, that the library, small as it is, be in the best possible condition for use. In its present quarters it is crowded for lack of room. The books are overflowing the shelf-space, the window-sills are stacked with them, and the floor-space is consumed by the chairs, tables and newspaper racks of a reading and study room for students. . . . A library building is needed even now, and the necessary steps should be taken at once, so that when the time shall come, there will be no delay in the erection of a suitable structure. The building should be of at least 100,000 volumes capacity, furnished with facilities for classification, service, compactness of storage, and distribution of light and heat, and thoroughly ventilated. There must be ample space for the administration of the library. . . .
>
> A large reading room appropriatedly furnished, lecture rooms, and rooms for special students, and unpacking and storage rooms are also among the equipments of such a building. Too great attention cannot be given, nor too soon, to a subject that is of the highest importance to the best interests of the University.

Both the faculty and the students supported Professor Miller's efforts to develop the University library. The minutes of a faculty meeting held on December 16, 1886, state that "a petition to the Board of Regents, for insertion in the estimates for the ensuing two years of salary for a Librarian was carried by unanimous vote by Faculty". The minutes of a meeting of the Board of Regents, held also on December 16, 1886, contain the following letter from the faculty:

> To the Regents of the University.
>
> Your petitioners respectfully urge you to appoint not later than at the opening of the next Academic year a Librarian, at a salary of not less than $1200 per annum.--who shall give his whole time to the care, arrangement, and indexing of the University library, and to the assistance of individual students in their studies with and among books; the library to be open and accessible not less than nine hours each day during the Academic year,--Sundays and holidays excepted--but Saturdays included.
>
> The right man in this place would be a positive inspiration to better work in every department, and would be almost equal to an assistant instructor in many lines of work.
>
> More than anything else is a good working Library the true center of University life. It is simply impossible for members of the Faculty, as at present employed to do much, if anything in the direction indicated. The result is that much time is lost by even the best students in aimless effort, in work which loses its real effectiveness, because students do not know how to do their work. A good librarian could and would touch helpfully all sides of student life and thought. He could readily become the most influential friend and potent force the students would know or feel. We need such a man every day.
>
> The University really cannot afford, in any sense of the word, to longer delay making this appointment.
>
> If your estimates for the next two years are already in the hands of the proper State authorities, we most earnestly beg you to amend them by adding a request for the amount named, as such a course seems necessary and desirable.

The regents received a communication also from many students, bearing upon the same general subject.

> To the Chancellor and Regents of the State University:

Your petitioners, students in the University desire to urge on your attention the very limited library facilities of the University. We have found, even in our comparative little use of it, that the library falls short of our actual necessities. There should be many more books, and many that we now have should be duplicated. It is almost impossible to secure some books, they are so constantly in demand.

With many of us, books are all the apparatus we use. We feel we are given poor facilities to do our work, especially when we see how much is asked for, and given in some directions.

The U. S. census for 1880 showed one hundred & forty one colleges and Universities having libraries of more than 10,000 volumes, and we only had 6,000 then, and they have probably grown faster than we have. We understand that good authorities say that not less than $10,000 should be expended at once to put our library in good working order. If this amount, or something near this is not secured at this legislature, then we must wait two years longer. We hope something can be done at once; and that some better arrangements may be made for students who use the library as their laboratory.

The minutes of the December 16, 1886 meeting of the Board of Regents continue, ". . . the Chancellor was directed to place among the items for legislative appropriations, the item: Salary of Librarian--$1200; Salary of Asst. Librarian--$300".

Professor Miller, whether he realized it or not, had helped to bring his services as librarian to an end. Miller was also Professor of Mathematics, and his duties in the Department involved a heavy load of teaching. The faculty and the students had requested a full time librarian, and the Board of Regents had supported their request to the legislature for funds. Ephraim Miller could not remain both librarian and Professor of Mathematics; he was forced to resign as librarian. The minutes of a meeting of the Board of Regents held on April 1, 1887, state that the Board, unanimously adopted the following resolution: "*Resolved*, that the Board of Regents in accepting the resignation of Prof. Miller as librarian of the University, does so with regret, and tenders the Professor its thanks for his faithfulness and efficiency in performing the duties of the position." The Board of Regents then elected Miss Carrie M. Watson as librarian.

Miss Carrie M. Watson had graduated from The University of Kansas in 1877 at the age of nineteen; in 1878 she became one of Ephraim Miller's assistants in the library in Fraser Hall. She had served an apprenticeship of nine years under Miller's supervision before she was elected librarian on April 1, 1887. Miss Watson studied library science in Boston during the summer of 1888, examining the library methods of the Athenaeum, the Harvard College Library, and the Boston Public Library. In 1899 she attended a summer library school at Amherst College, birthplace of the Dewey decimal system. Later she took a course in bibliography in a summer session at Yale University [*The Graduate Magazine* 78; Hyder 1, p. 203]. She became Librarian Emerita in 1921, and was succeeded by Earl N. Manchester. Miss Watson died in 1943 at the age of eighty-five [*The Graduate Magazine* 91, 78]. In addition to her "History of the Library" in Sterling's *Quarter-Centennial History of The University of Kansas* [Sterling 1, pp. 103-128], Miss Watson wrote two articles about the library [*The Graduate Magazine* 44, 138]; also two articles have appeared which contain summaries and evaluations of her career [*The Graduate Magazine* 91, 78]. Some of the statements made about Miss Watson, however, do not give proper credit to Ephraim Miller as University Librarian. The following statement occurs in the announcement of her death [*The Graduate Magazine* 91]:

> She became assistant librarian in 1878 and librarian in 1887, carrying on till 1921 when she was made Librarian emerita. Without benefit of special training at any library school this young woman took over the small collection of books in a room in Fraser Hall, set up a cataloguing system and all the intricate mechanics of a University library, kept abreast of its problems as it expanded into a building of its own, Spooner Library, in 1894, and thereafter saw it grow into a splendidly selected and efficiently supervised collection of nearly 200,000 books and pamphlets before turning it

over to the new director.

This statement ignores Miller's services during more than twelve years as University Librarian; it ignores also the fact that Miss Watson served an apprenticeship in the library under Miller's supervision for nine years. The library which Miss Watson took over in 1887 had been indexed and classified; much of the work was done by Miller personally. The statement that she served as librarian "without benefit of special training at any library school" is misleading at best, for Miss Watson studied library science in the East during three summers. Margaret Lynn wrote in *The Graduate Magazine* [*The Graduate Magazine* 78]:

> When Miss Watson became assistant the librarian was some member of the faculty, chosen annually. In 1877 Professor Ephraim Miller was in charge and it was not until 1887 that Miss Watson became librarian.

Professor Miller's services as University Librarian for more than twelve years (he was not chosen annually), in addition to his full-time teaching load as Professor of Mathematics, deserve more adequate recognition. Miss Lynn's article is accompanied by a photograph which carries the following caption:

> At right are the University's three librarians since its beginning--Charles M. Baker, who began in 1928, Miss Watson, who served as librarian from 1887 to 1921, and Earl N. Manchester, who was in charge from 1921 to 1928. He is now librarian at Ohio State.

There were five librarians (Regents J. S. Emery and W. C. Tenney; Professors Frank H. Snow, Byron C. Smith, and Ephraim Miller) who preceded Carrie M. Watson, and one of them--Ephraim Miller--performed notable services for more than twelve years. Miss Watson herself was well aware of those who preceded her, and she acknowledged the notable services of Ephraim Miller [*The Graduate Magazine* 44 (2), pp. 7-8; this article contains a photograph of Ephraim Miller and Carrie M. Watson taken together in California in the summer of 1925].

Professor Miller's librarian's reports and the petitions of the faculty and students led not only to the appointment of Miss Watson as a full-time librarian, but also to the provision of greatly expanded quarters for the library. Robert Taft reproduced a newspaper account which describes the remodeling of the north end of the first floor of Fraser Hall [Taft 1, p. 35].

> Upon turning and walking down the hall, he was attracted by the workmen in the new library in the north end of the building. Turning his steps in this direction he found the librarian, Miss Carrie M. Watson, directing a number of workmen in fitting up the rooms to be occupied. The library as it will now be arranged, will contain over three times the room formerly occupied by it in the south end. As has been stated in a previous issue, Prof. Miller's old lecture room will be fitted up and used as a reading room. Prof. Templin's old room is with the general library, while the large hall opening into it will be fitted up with shelves and alcoves for congressional documents. Prof. P. J. William's old room will be used for the new library. Miss Watson is hard at work every day arranging the books which are now being classified after the system used in the best eastern libraries. Miss Watson informed the reporter that the library would be increased very much in value by a gift of 250 volumes of valuable books, together with a large number of Congressional books, which would be known as the Haskell Loan Library.

The library contained 8,035 volumes when it moved from room C (room 14) at the south end of the first floor of Fraser Hall to its new quarters at the north end of the first floor; Miss Watson has described the location and operation of the library in its new quarters [Sterling 1, pp. 113-115]. Writing in 1891, she described the space then occupied by the library.

> At present the general library occupies all of the rooms on the first floor of the north wing of the main building and one room in the basement. It includes the reading room, with the librarian's office adjoining it, and the two book rooms, besides the hall way between these rooms, which makes a separate room for the public documents. The basement room is used for storage, for unpacking new books and for packing books for binding.

Very little is known about the mathematics books in the library at this time. Miss Watson does mention, however, that thirteen volumes of J. L. Lagrange's collected works had been purchased by the library along with other books in the two-year period preceding 1891 [Sterling 1, pp. 125-126]. This purchase emphasizes that the Library was building for the future rather than buying books for the immediate use of the current staff and students. It has often been said that The University of Kansas has a fine mathematics library because its first important librarian, Ephraim Miller, was a mathematician, and because he early placed special emphasis on building up collections of mathematics journals. Miller was a mathematician, but no evidence has been found to support the claim that he emphasized mathematics or that he made any special contribution to building up the library's holdings in the field of mathematics.

There were two important developments during F. H. Snow's term as chancellor that promoted the development of the library; the first of these was the building of Spooner Library. William B. Spooner, a resident of Boston and a great-uncle of Chancellor Snow, had died in 1880, leaving a bequest to the University. Spooner's will had been long and complicated, and the executor was not able to deliver the bequest to the University until the fall of 1891. The bequest amounted to almost $100,000, and its use was not specified by the donor. Chancellor Snow recommended that the entire sum be used to build a library, but the Board of Regents decided to use a part of it to build a chancellor's residence. Construction on Spooner Library and on the chancellor's residence (which was located at the northwest corner of 14th and Louisiana Streets) began in the summer of 1893; the Snows moved into their new home on December 30, 1893 [Hyder 1, pp. 201-202]. Spooner Hall was designed as a library building for 100,000 books [Taft 1, pp. 58-60, 125]. Is it possible that Ephraim Miller's Librarian's report to the Board of Regents in 1885 was used to draw the plans for the new building? Spooner Library was completed in the summer of 1894 and dedicated on October 10, 1894. Miss Watson supervised the moving of the library's 20,000 volumes from Fraser Hall in the summer of 1894; she has described the start of the move as follows [*The Graduate Magazine* 44 (2), p. 8]:

> August 1, 1894, the work of carrying the 20,000 volumes from Fraser Hall to the new Spooner Library was begun. While writing this history, a reminiscent mood comes. On the morning the moving started, ex-Chancellor Marvin walked into the library and said, "May I sit here this morning, for this is a great day to me?" It was Chancellor Marvin who had the tall alcoves built in the one room and started the library, so his benign countenance lighted up with pleasure when he saw the little library he started 16 years before moving into a fine building all its own.

There are references to the move from Fraser to Spooner also in library reminiscences which Miss Watson gave in a chapel talk [*The Graduate Magazine* 138]. Some of the dates and figures in Miss Watson's later accounts of the library are not accurate.

C. K. Hyder tells us that "in his reports Chancellor Snow stressed the importance of library funds, and during his administration the number of books almost trebled" [Hyder 1, p. 203]. The second important development that promoted the library during Snow's administration (the building of Spooner Library was the first) was the founding of the *Kansas University Quarterly*, which later became the *Kansas University Science Bulletin* (see chapter 2, above). In his first report to the Board of Regents as chancellor, Snow recommended "the inauguration of a series of official university bulletins through which the investigations and discoveries of our faculty might be made known to the world". The result of this recommendation, the *Kansas University Quarterly*, did indeed provide a channel for the publication of faculty research. In addition, however, the new journal was exchanged for scholarly and research journals in all parts of the world. The importance of these exchanges is indicated by the fact that the "List of Publications Received in Exchange for the Kansas University Quarterly", published in the *Kansas University Quarterly*, series A, vol. X, no. 4, October 1901, filled some eight pages and contained the names of about 340 journals. Of these 340 journals, about 140 came from the United States, and about 200 came from abroad. The list does not contain a large number of mathematics journals, but Professor Babcock reported that many more mathematics journals were obtained in exchange for the *Kansas University Science Bulletin* after the publication of Henry Byron Newson's "Theory of Collineations" in volume 6 in 1911. There is ample evidence that Snow's research journal, the *Kansas University Quarterly*, later the *Kansas University Science Bulletin*, made a major contribution to the expansion of the periodical holdings of the University library.

The period of rapid expansion of the Library which began during Snow's chancellorship brought many additional books and periodicals in the field of mathematics, and the 1904-1905 University Catalog provides some information about the mathematics collection. Page 148 contains, along with descriptions of the mathematics models and of the six inch telescope and other equipment for astronomy, the following paragraph about the library.

> The University library contains about 1000 volumes of mathematical works, including nearly all of the standard treatises on all branches of mathematics. Among others, the following complete sets of journals

> are especially valuable: *The American Journal of Mathematics*, *Annals of Mathematics*, *Bulletin and Transactions of the American Mathematical Society*, *American Mathematical Monthly*, *Mathematische Annalen*, *Acta Mathematica*, *Bulletin de la Societe Mathematique de France*, *Journal de Mathematiques pures et appliquees*, *Annali di Matematica*, series III. On the bibliographical side are to be found the *Jahrbuch der Fortschritte der Mathematik* and the *Revue Semestrielle des Publications Mathematiques*, both sets complete. There are, in addition, the collected works of several of the great mathematicians of the last century. Nearly all of the mathematical journals of Europe and America are regularly received.

The mathematics collection grew rapidly: the University Catalog for 1907-1908 reports that "the University Library contains more than 2000 volumes of mathematical works". The 1908-1909 University Catalog reports a new development.

> Departmental Reading-Rooms. The departments of German, philosophy, Latin, English and mathematics have reading rooms on the lower floor of the Library, and the departments of American and European history, sociology and economics have the whole of the upper floor of the building.

Later catalogs continued to describe departmental reading rooms (they were in Spooner Library), but there was no further mention of a reading room for mathematics. Page 396 of the University Catalog for 1911-1912, however, describes another development as follows.

> Department Libraries. Besides the books in Spooner Library Building, there are eleven departmental libraries in the different buildings of the University. They are placed in close conjunction with the various laboratories and lecture rooms, so as to be immediately accessible to students in scientific work.

For several years the catalogs did not give detailed information about "departmental reading rooms" and "department libraries", and it is not possible to be entirely sure about even their number and locations. The University

Catalog for 1914-1915, however, contains a considerable amount of specific information about the University libraries [p. 411].

> The libraries of the University contain over 100,000 bound volumes and some 43,200 pamphlets, in addition to a considerable number of unbound serials and unclassified pamphlets. An annual appropriation of $20,000 is devoted to the purchase of books.

The 1914-1915 catalog contains, on pages 411-412, the following specific information about departmental reading rooms and department libraries.

> The departmental reading rooms are in Spooner Library Building. To them are brought the books in immediate use by their respective departments. These departments, with a rough estimate of the number of special volumes at their command, are as follows:

| | |
|---|---|
| Education | 3,214 |
| English | 11,421 |
| German | 4,323 |
| Latin | 2,115 |
| Greek | 2,751 |
| Romance Languages | 4,451 |

> About 6,000 books belonging to the department of history, sociology, and economics are permanently shelved in the large reading room on the second floor of Spooner Library. The other books of these departments are shelved in the stacks, and are available through the general reading room.
>
> The departmental or school libraries housed with their respective departments or schools number volumes as follows:

| | |
|---|---|
| Biological (Snow Hall) | 3,988 |
| Chemical (Chemistry Building) | 2,380 |
| Engineering (Marvin Hall) | 3,917 |
| Geological (Haworth Hall) | 2,164 |
| Law (Green Hall) | 7,580 |
| Mathematical (Administration Building) | 2,000 |
| Philosophical (Administration Building) | 2,700 |
| Physics (Blake Hall) | 1,012 |
| Medical (Bell Memorial Hospital, Rosedale) | 5,406 |

The establishment of the Mathematics Library in Strong Hall (called the Administration Building at that time) was a development of great importance for the Department of Mathematics; since little information is available in the catalogs, other sources have been searched for its history. The available information about the origin and establishment of departmental libraries in general, and about the Mathematics Library in particular, will now be described.

The east wing of the Administration Building was completed in 1911, and the University Catalog for 1911-1912 shows that several members of the mathematics staff had their offices in the new building during that academic year. In October 1913, Lydia E. Cook published an article [*The Graduate Magazine* 34] which describes the Administration Building and some of the activities located in it. Three plates accompany the article. The first shows the completed foundations for the center section of the Administration Building--a section not completed until 1923. The second plate shows two views of the psychology laboratories in the basement of the completed east wing of the Administration Building. The third plate shows an exterior view of the completed east wing and also a view of the Mathematics and Philosophy Library on the first floor of the east wing. The room occupied by this library is easily identified as the present room 103 Strong Hall. Professor Wealthy Babcock remembers that the Mathematics and Philosophy Library was located in this room. The text of Lydia Cook's article contains this explanation:

> On the first floor is a representative departmental library, Plate III, a pleasant room containing the usual arrangement of bookcases, tables and chairs. The library of philosophy and mathematics, consisting of about three thousand volumes is placed on those shelves for the greater convenience of the students who must spend valuable hours in the company of those books.
>
> The departmental library is a comparatively new institution at the University of Kansas. It grew gradually out of a practice

> among the professors of the various departments, of carrying off from the main library, a group of volumes wanted for the immediate use of students interested. This practice flourished until finally in the winter of 1910 these young branch libraries became a systematic and recognized institution. As yet it is understood among those prominent in library work in the University that the departmental library as a unit, is in the strictly experimental stage.
>
> It remains to be worked out as to just what sort of a fortune awaits it, though opinion at present is quite favorable.

An article published in April 1917 describes again the departmental libraries [*The Graduate Magazine* 139].

> Besides the main library in Spooner seven departmental libraries have been organized. There is the law library in Green Hall with 18,591 volumes. Miss Nell Kent Hudson is the librarian there. Miss Anita Hosteller has charge of the 2,916 volumes in the chemistry library. The philosophy and mathematics library in the Administration building contains 5,126 volumes with Mr. Edward E. Bennett as the librarian. Miss Maud I. Spencer is custodian of the 2,620 books in Haworth Hall. The 4,079 books in the biological library are in charge of Miss Jennie Dahlene. Miss Woodbury is librarian of the Physics department, which contains 561 volumes. And last of all, down at Rosedale there is a medical library, with Miss Evelyn Stanton in charge of 5,000 books.

Everyone knows that almost all chancellors and librarians are opposed to the establishment of departmental libraries. There are two reasons for their opposition. First, for the convenience of *some* users of the University Library, *all* books should be in a single building. Second, the operation of the library is more efficient and less expensive in a single centralized library. In the light of this second reason, it seems remarkable that The University of Kansas--almost never adequately financed--established numerous departmental libraries beginning in 1910. Robert Taft suggests that, in addition to their obvious convenience for the schools and departments, there was a more practical reason [Taft 1, p. 125].

> In the period of years elapsing since the completion of Spooner Library in 1894, the addition of books had caused, by 1923, an eight-fold increase in its contents. In this period of years, the library had literally grown into Spooner and out of it; for when the building was opened, its twenty thousand volumes had looked meager on shelves providing five times that number. By 1915, however, its capacity was exceeded; and departmental libraries had sprung up over the campus, partly for convenience but more largely because there was no longer sufficient space in Spooner.

The establishment of the Mathematics and Philosophy Library occurred near the beginning of the period treated in chapter 3 of this history. As explained in that chapter there is in existence, for each of the academic years 1913-1914 through 1917-1918, a bound volume which contains the Department's records, specially prepared reports summarizing the year's activities, and official correspondence; these five volumes contain information about the library.

The University library received an annual appropriation for the purchase of books. From this sum the University made allocations to the separate schools and departments, and they were responsible for selecting the books and journals to be bought. One of the standing committees of the Department of Mathematics was the Committee on Library and Apparatus; the Department delegated to this committee the responsibility for the selection of books and for the oversight of the library. In 1913-1914 the Committee on Library and Apparatus consisted of Van der Vries, Lefschetz, and Jordan; during the other four years covered by the reports, the committee consisted of Van der Vries, Stouffer, and Lefschetz. The handwriting in the last four reports indicates that the clerical work of keeping records and forwarding orders to the main library was carried on by Professor Stouffer.

The report of the Committee on Library and Apparatus concerning the library for the year 1913-1914 begins as follows:

> The department received its regular appropriation of $300.00 and an additional $30.00 as its share of a surplus in the library fund. The authorities were also persuaded to award to the department a special appropriation of $150.00 for the filling up of gaps in our journals. The department thus had a total of $480.00 at its disposal, as is evidenced by letter on page 20. This amount was expended by the purchase of the volumes listed on page 21, and in filling up the gaps in journals by the purchase of the numbers of the magazines and journals listed on page 22. The journals with the exception of *Rendiconti* have arrived and are either in the library or in the bindery. The individual volumes checked in the list have arrived, the others being still on the way.
>
> The library of the department now possesses complete files of the following journals:

The list which followed contained the titles of eighteen of the most important mathematical journals published in the United States and in Europe. The report states that missing numbers had been ordered to complete the files of four other journals and gives a list of twenty-two journals for which "the Department is now a paid subscriber". Finally, the report states that the Department received the *American Mathematical Monthly* because it is "one of the subsidizers of the same", and that the Department "also has a standing order for all numbers of: *Encyclopedie des Sciences Mathematiques*, *Encyklopadie der Mathematischen Wissenschaften*, and *Euler Opera*".

For the year 1914-1915, the Committee on Library and Apparatus reported on the library as follows:

> All of the volumes ordered by the department during the year 1913-1914 were received with one exception, viz., *Elements de la Theorie des Integrals Abeliennes*, par M. Tikhomadritzki. Of the journals, *Acta Mathematica*, *Annals of Mathematics*, and *Rendiconti di Palermo* are still lacking a few numbers.
>
> The amount apportioned to the department of mathematics for the year 1914-15 for library purposes was $448.00. There were ordered during the year on recommendation of the library committee a total of 301 volumes, including in addition to individual volumes and sets of complete works,

a) A complete set of *Annales Scientifiques de l'Ecole Normale Sup'e,*

b) Series 1, 1836-55, *Journal de Mathematiques, Pures et Appliques,*

c) Series 1 and 2 (82 Vol's.) *Journal de l'Ecole Polytechnique.*

Of the 301 volumes, 90 have arrived and the remainder are still "in statu quo". There was left in the department fund on June 3, 1915 a balance of $471.00, all of it, however, covered by outstanding orders. (For list of books ordered and date of order see pages 19-31 of this report). There was great fear that this sum would revert to the state, June 30, 1915, it being the end of a biennium. The matter was taken up with the Board of Administration with the result that special action was taken by them (see pages 32-34) June 23, 1915 ordering the library balance to be carried over after July 1, 1915. The department therefore has at the present time in addition to its appropriation for the current year sufficient funds to cover all outstanding orders made during the 1913-15 biennium.

Only a partial apportionment of library funds has been made for the year 1915-16. The whole matter of apportionment has been placed in the hands of a committee, of which Professor Millis is chairman.

This report indicates that the Department was making strenuous efforts to obtain books and journals for its library. The lists of books ordered fills twelve pages in the Department's report, but most of the books ordered were not received--the United States had been cut off from the supply in Europe by World War I. On June 3, 1915, Professor Van der Vries wrote to Chancellor Strong thus:

There is in the library fund of the department a balance of $471.00. This is however more than covered by outstanding orders. As previous letters from the department will show, the department has been endeavoring for a number of years to complete its files of foreign periodicals. It is very important that this be done. The books ordered have all been ordered *within the last year.* The orders could therefore not be countermanded (and the money used in purchasing American books) without hurting the credit and fair name of the University of Kansas. The European war has delayed their delivery. The department does not feel that it should be made to suffer on this account. The library budget of the department for next year is not even large enough to purchase the additional books which will be needed then, in fact are needed now. A failure to provide a way to care for the above balance will mean that the department will not

> be in a position to purchase a single book next year, as its appropriation would have to be kept for the purpose of paying for these outstanding orders. This will be a great handicap and would do incalcuable injury. The department feels that the University should provide some means or work out a plan by which the balance in our favor on July 1, 1915, should be carried over on the credit side of the library account of the department.

The Board of Administration, at its meeting on June 5, 9, and 10 (1915) "ordered that the library balance in the Department of Mathematics be carried over after July 1st, 1915, if necessary".

But the difficulties caused by the war continued. The report on the library for 1915-1916 reads as follows:

> Of the volumes ordered by the department during the year 1913-14 six have arrived during the past year. There remain two volumes which are still due.
>
> Of the volumes ordered during the year 1914-15 twenty three (23) have arrived during the past year. There are still due forty five (45) which were ordered during this period.
>
> During the past year (i.e., the year 1915-1916) the department has had at its disposal $500.00. The committee has had numerous meetings and has studied the matter carefully. One hundred seventy nine (179) volumes have been ordered. Of these only 44 have arrived. The above figures are here given to show the difficulty which the committee is experiencing in the expenditure of its funds on account of the war.
>
> The committee has made a special effort to improve the library along the lines of mechanics and applied mathematics.
>
> For a complete list of books ordered see pages 24-40 of this report. The books checked are those which have already arrived.

Professor Van der Vries signed the following report on the library for 1916-1917.

The situation abroad is causing the same difficulty in the expenditure of library funds as has been the case since Aug. 1914. The committee on library has labored industriously and ordered a total of 265 volumes. The sum at the disposal of the department was $500.00 in addition to the surplus from the previous year. It is difficult to state the exact status of the departmental exchequer at the present time. No money was lost however at the end of the 1915-17 biennium as an adjustment is made prior to the end of the biennium between those departments which have overdrawn and those which have a balance, the respective budgets of the departments being readjusted after the new biennium is entered upon. Two books ordered during the year 1915-16 appeared during the past year, but no outstanding orders of previous years have been filled during the past year and may be considered as cancelled. The list of books ordered during the past year may be found on pages 29-44, the books checked having already made their appearance. The department is urged to see that all desired books in the English and French languages are purchased during the present situation and should hand the names of such books to the library committee at once.

The Department's report for 1917-1918 describes the following as the "Report of the Library Committee", submitted by E. B. Stouffer.

There have been ordered during the year 1917-18 a total of 138 books with an expenditure of approximately $386.00. Of these books 27 have arrived. All orders previous to the year 1915-16 have been duplicated or may be considered as cancelled. In the following table there is given the number of books not yet received from orders of the past three years and the approximate amount involved in these orders.

| Year | No. Books | Value |
|---|---|---|
| 1915-16 | 87 | $206.00 |
| 1916-17 | 122 | 242.00 |
| 1917-18 | 121 | 342.00 |
| Total | 330 | $890.00 |

A count of the volumes in the library on June 2, 1917 showed a total of 1942 and a similar count on May 28, 1918 showed a total of 2040, a gain of 98. These figures do not include unbound volumes. During the year one volume was lost, a copy of Cajori's *History of Mathematics*.

A list of the books ordered during the past year follows on later pages.

This report was followed by a letter dated October 17, 1917 from Chancellor Strong concerning the Department's library allocation for the year 1917-1918.

> At a meeting of the Library Committee on Monday, the 15th inst., it was moved and carried that the appropriations for the various departments and schools be reduced twenty per cent for the year 1917-18; that the general library appropriation for periodicals, reference books and bibliographies be not reduced, and that the residue constitute the "sets" fund.
>
> The amount apportioned for your department is $400.00. The reduction was necessary because of the insufficient appropriation by the last legislature.

The reports on the library by the Committee on Library and Apparatus in the five volumes of Department reports emphasize (a) the strenuous efforts made by the Department to build a mathematics library that would be strong in both books and journals; (b) the series of difficulties caused by World War I, which prevented the Department from obtaining many of the books and journals it sought from Europe; and (c) the personal and loving care lavished on the Mathematics Library by members of the Department's senior staff.

The history of any library is a succession of problems: success in expanding the library's collections automatically creates the problem of how to house them. The University Library had outgrown the space in Spooner Library by 1915, and the creation of the school and departmental libraries was one part of the effort to relieve the space problem. But the only real solution was a new library building, and the construction of a new library was one of the high priority tasks awaiting Lindley when he became chancellor in 1920.

Chancellor Lindley obtained an appropriation of $250,000 from the legislature in 1921 to build a new library; $60,000 was added to this amount in 1925. Construction began in the spring of 1923, the books were moved from Spooner

Library to the new building in the summer of 1924, and the new library was opened for student use on September 11, 1924. During commencement week in 1924, it was announced that the new library had been named Watson Library in honor of Miss Carrie M. Watson [Taft 1, pp. 125-127].

The completion of Watson Library brought a change in the Mathematics Library. An article published in April 1926 by Earl N. Manchester, Director of Libraries, describes the new Watson Library; it contains the following paragraph [*The Graduate Magazine* 44 (1), pp. 3-4].

> A flight of stairs at the right leads on to a room on the entrance level of the building. Here is a room with a delivery counter similar to those in the room below, with space for 90 readers at 10 tables. Around the walls are reference sets of books in Philosophy and Education, and in a room behind the counter you see book stacks containing the collections of books in Education, Philosophy and Psychology. No more walking from Spooner to the administration building and back to consult assigned references in books in these courses. They are all in this room and in the stacks adjoining.

The meaning of this paragraph is clear: the Philosophy Library had been moved from Strong Hall to Watson Library. Although no direct statement has been found, it seems certain that at the same time the Mathematics Library moved from room 103 to room 207 Strong Hall, where it has been ever since.

Professor E. B. Stouffer signed, as chairman, the report of the library committee for 1917-1918. It is not known how long he continued in this position, but eventually he was succeeded by Professor Guy W. Smith. As stated above [*The Graduate Magazine* 139], Mr. Edward E. Bennett had been the full-time librarian in charge of the Mathematics and Philosophy Library. Eventually, the Mathematics Library lost its librarian, probably when it moved to room 207 Strong Hall. From that time on the Mathematics Library was operated, with some student help, by the Chairman of the Department's Library Committee. Thus, the Chairman of the Department's Library Committee had a lot of real work to do--selecting and ordering books, preparing cards for the catalog, checking books on the shelf against the shelf list, sending journals to the bindery to be bound, and so on. Professor Smith was the Department's Librarian until 1934.

Professor Wealthy Babcock was appointed Librarian of the Mathematics Library in April 1934, and she held this position until she retired from active teaching in 1966. Most of the period from 1934 to 1966 was an exceptionally difficult one for the library. The 1930's were dominated by the Great Depression worldwide and the Dust Bowl locally. The legislature cut the University's appropriations, and the Mathematics Library was forced to cancel subscriptions to many of its best journals. The 1940's were dominated by World War II; the war created gaps in the files of many of the Department's journals. After World War II, library funds became available again, and Professor Babcock bore the responsibility for buying new books, adding subscriptions to the new journals, and locating back numbers of journals to fill the gaps caused by the cancellation of subscriptions in the 1930's and the disruptions of war in the 1940's. She was remarkably successful in repairing the damages of the past and in raising the Mathematics Library to new high levels of excellence. In grateful recognition of her services, the Department of Mathematics named its library The Wealthy Babcock Mathematics Library at the Honor's Dinner on April 20, 1964.

When Miss Carrie M. Watson retired in 1921, she was succeeded by Earl N. Manchester, who had the title Director of Libraries [*The Graduate Magazine* 44]. Manchester resigned in 1928 and became Librarian of Ohio State University; he was succeeded by Charles M. Baker in 1928 [*The Graduate Magazine* 68]. When Mr. Baker retired in 1952, he was succeeded by Robert Vosper [*The Graduate Magazine* 128]. Mr. Vosper, with strong support from Chancellor Murphy, expanded the collections and raised The University of Kansas Library to new heights of excellence [*The Graduate Magazine* 128-135]. When Mr. Vosper resigned to become Librarian of the University of California at Los Angeles in 1961, he was succeeded by Thomas R. Buckman [*The Graduate Magazine* 133]. When Mr. Buckman resigned in 1969 to become Librarian of Northwestern University, he was succeeded by Mr. David W. Heron.

Blake Hall, the physics building, was built in 1895, and Bailey Hall, the chemistry and pharmacy building, was built in 1900. By 1950 these buildings were not only antiquated but also completely inadequate in size. As early as the spring of 1949, Chancellor Malott obtained an appropriation from the legislature to build a single science building for physics, chemistry, and pharmacy [*The Graduate Magazine* 140]. The building was dedicated on November 5, 1954, the dedication address was given by former Chancellor Deane W. Malott, and the building was named Malott Hall in his honor [*The Graduate Magazine* 111].

One feature of the new Malott Hall was a Science Library, with shelf space for 25,000 volumes, on the top floor. Since the libraries of the School of Pharmacy and the Departments of Chemistry and Physics were not large, most of the shelves in the Science Library remained empty after the building was occupied. These empty shelves seemed to embarrass Chancellor Murphy; as a result, he worked out a plan to fill the empty shelves and at the same time to gain efficiency in the operation of the University libraries. The plan was simple: the Mathematics Library would be moved to Malott Hall and combined with the Science Library. The plan seemed reasonable and proper to everybody--except to the Department of Mathematics.

I learned of the plan first from Dean Waggoner, who approved the chancellor's plan heartily. According to Dean Waggoner, the inconvenience would be slight, the exercise gained in walking across the campus would be healthful, and the mathematics staff might even get acquainted with some of the other scientists in the University as a result of using a common library. I told Dean Waggoner firmly that the Department of Mathematics recognized that Chancellor Murphy had the authority to move the Mathematics Library, but that the Department would never approve nor agree to the move. Soon thereafter I received, as the Chairman of the Department, a letter from Chancellor Murphy concerning the proposed move. The reaction of the Department to the chancellor's plan is described in the following paragraphs in the minutes of a meeting of the senior staff held on December 1, 1955:

> Mr. Price read a letter from the Chancellor concerning the moving of the Mathematics Library from Strong Hall to Malott Hall.
>
> On motion of Mr. Schatten and Mr. Springer it was voted to ask the Chancellor for an appointment to discuss the library move.
>
> On motion of Mr. Springer and Mr. Guy Smith it was voted that the department go on record as being unanimously opposed to the moving of the library.

The minutes of a meeting of the senior staff held at 4:00 p.m. on December 5, 1955, in 217 Strong Hall list the names of the twelve members present and continue as follows.

> The minutes of the December 1st meeting were read and accepted.
>
> Mr. Price stated that an appointment had been made for the Chancellor to meet with the department at 4:00 p.m., Monday, December 12th.
>
> Informal discussion concerning the proposed moving of the Mathematics Library followed.
>
> On motion of Guy Smith and Miss Babcock it was voted that a committee draw up a statement or statements to be presented to

the Chancellor. It was agreed that the committee be composed of Mr. Price, Guy Smith, Miss Babcock, Mr. Springer and Mr. Aronszajn. It was further agreed that the department meet Friday, December 9th at 5:00 p.m. to hear the report from the committee.

The meeting adjourned.

Florence Black, Secretary

The minutes of the meeting held at 5:00 p.m. on Friday, December 9, 1955, in 217 Strong Hall are the following.

The committee appointed to present data to the Chancellor concerning the proposed moving of the Mathematics Library, read their reports to the department. Informal discussions followed.

The meeting adjourned.

Florence Black, Secretary

At the appointed time--4:00 p.m. on Monday, December 12, 1955--the entire staff of the Department of Mathematics met with Chancellor Murphy around a large conference table in the chancellor's office in Strong Hall. The meeting was a peaceful and friendly one (there were no confrontations or non-negotiable demands!), but one by one the members of the committee presented as forcefully as possible the Department's arguments against moving the Mathematics Library to Malott Hall. Two of the many arguments stood out. First, easy accessibility to the Mathematics Library was more than a matter of convenience. A mathematician seldom checks a book out of the library and reads it through from cover to cover. Instead, a mathematician is more likely to refer--in the midst of his research--to a book or journal to get the exact statement of a theorem or formula. In such circumstances, the mathematician feels that it is important to be able to check a reference quickly so that work can be continued while the idea is fresh.

For this reason the Mathematics Library in Fine Hall at Princeton University remains open twenty-four hours every day. In contrast, the Science Library in Malott Hall is locked at night and keys are not issued to anyone.

The second argument for leaving the Mathematics Library in Strong Hall was this: the Mathematics Library is a superior library, not because of the attention it had received from the University's professional library staff, but rather because of the close and devoted personal attention to it my members of the Department's senior staff since the early days of the University. The committee described the kind of attention and loving care the Mathematics Library had always received from the Department's Library Committee and, indeed, from the entire senior staff. (For example, see the description of the work by the Department's Committee on Library and Apparatus at the time of World War I and more recently by Professor Babcock.) The committee told Chancellor Murphy that, in its opinion, the Mathematics Library would deteriorate if it were removed from the care and supervision of the Department of Mathematics in Strong Hall and placed under the control of the University's library staff.

After the conference some members of the staff said they believed that Chancellor Murphy had made his decision before we entered the room. In any case, he listened patiently while each member of the committee explained why the Mathematics Library should not be moved to Malott Hall but left in Strong Hall. When the last one had finished, Dr. Murphy announced his decision with characteristic quickness, terseness, and finality. Professor Florence Black recorded the result of the conference with corresponding brevity in the following postscript to the minutes of the meeting of the staff held on December 9, 1955.

> The members of the permanent staff met with the Chancellor on Monday, December 12, 1955. After hearing the reports from the committee, the chancellor stated that the library would not be moved till the Department could be moved with it.

The Department of Mathematics has always been grateful to Chancellor Murphy for understanding its position on its library, and for leaving the Mathematics Library in Strong Hall.

The Wealthy Babcock Mathematics Library has continued to prosper. The period from 1945 to 1970 was one of very great activity in mathematics, and--since the characteristic activity of a mathematician is the writing of books and research papers--mathematical publication has been heavy. The Mathematics Library regularly receives about three hundred periodical publications at the present time, and it buys at least all of the books of interest to members of the staff. Since space for book stacks is severely limited in the Mathematics Library, many of the older and less used books and journals have been moved to the Science Library in Malott Hall.

When the east wing of Strong Hall was remodeled in 1960-1961 to provide offices for the staff of the Department of Mathematics, space was remodeled also for the Mathematics Library. Room 209 Strong Hall was remodeled, air conditioned, provided with library tables and chairs, and furnished with appropriate card catalogs and shelves for displaying current numbers of journals. The book stacks remained in room 207 Strong Hall, but in recent years these have overflowed into the reading room in 209 Strong Hall.

The expansion of the University's library collections by Chancellor Murphy and Librarian Robert Vosper necessitated a larger library building. The 1961 legislature appropriated $1,800,000 to build a large addition to Watson Library and to air condition the entire building [*The Graduate Magazine* 131]. The problem of buying books and of providing space to house them is the never-ending problem of the Library!

The Spencer Research Library is the most recent addition to the University's library system. Kenneth Spencer inherited a coal mining business in southeast Kansas from his father, and during World War II he built and operated a powder plant for the government at Parsons, Kansas. Out of this background Spencer developed the Spencer Chemical Company after World War II. He died unexpectedly on February 19, 1960 [Distinguished Graduates of K. U. 25]. Later his wife gave the University a gift of $2,125,000 to build the Spencer Research Library in his memory. The Spencer Research Library was dedicated on November 8, 1968; the dedication speaker was Sir Charles Percy Snow, the distinguished British novelist-scientist and government official [*The Graduate Magazine* 141].

Professor U. G. Mitchell made a collection of old and rare books on mathematics which he gave to the Mathematics Library. After the Spencer Research Library was completed, Professor Mitchell's books were moved to it--the controlled temperature and humidity there are designed to aid in the preservation of old and rare books. The Department of Mathematics has always regretted that Professor Mitchell's books were dispersed among the general collection in Spencer Research Library rather than preserved as Professor Mitchell's collection.

Professor Robert E. Powell was chairman of the Department's Library Committee for two years (1966-1968) after Professor Babcock retired in 1966. He rearranged the reading room (209 Strong Hall) of The Wealthy Babcock Mathematics Library, especially so as to make the bibliographical references more readily available to the readers. During the next two years (1968-1970) Professor Ronald Jacobowitz was the chairman of the Department's Library Committee.

Early in the 1960's the University Library was able to provide a full-time library assistant for the Mathematics Library again. The first several of these library assistants served for relatively short periods; Mrs. Bernice R. Smysor, however, became the library assistant in the Mathematics Library on February 1, 1968, and she continues to hold this position. She published an account of The Wealthy Babcock Mathematics Library in *Books and Libraries at the University of Kansas*, vol. 8, no. 4, June 1971.

References and Notes

*American Mathematical Monthly*

1. "Kansas Section of the Mathematical Association of America." *American Mathematical Monthly*, vol. 23 (1916), pp. 164-165. This report describes the first meeting of the Kansas Section of the Mathematical Association of America. It was held in Lawrence on March 18, 1916. Opposite page 164 there is a group photograph captioned: "Members of the Kansas Section of the Mathematical Association of America, in Session at Lawrence, Kansas, March 18, 1916". Ashton, Jordan, Lefschetz, Mitchell, Van der Vries, and Wheeler are conspicuous in the photograph.

Archibald, Raymond Clare

1. *A Semicentennial History of the American Mathematical Society, 1888-1938*. New York: American Mathematical Society, 1938. x + 262 pages.

2. "Undergraduate Mathematics Clubs." *American Mathematical Monthly*, vol. 25 (1918), pp. 33-38, 448-463.

Aronszajn, Nachman

1. "Selected at Random--These Are a Few of K. U.'s Distinguished Faculty." *The University of Kansas Alumni Magazine*, vol. 59 (1960-1961), October 1960, no. 2, pp. 8-9. On page 8 we find a photograph of Nachman Aronszajn standing before his mathematics-filled blackboard.

2. "Nachman Aronszajn Appointed to Distinguished Professorship." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), June 1963, no. 9, p. 12. This article contains a large photograph of Professor Aronszajn and an account of his appointment to a Summerfield Distinguished Professorship. He was appointed to the distinguished professorship relinquished by Dr. Cora M. Downs, retiring professor of bacteriology. There is a short account of Professor Aronszajn's career.

Ashton, Charles Hamilton

1. "Death Takes Three Strong Figures." *The Graduate Magazine*, vol. 35 (1936-1937), September 1936, no. 1, p. 17. This page contains photographs of Dean George C. Shaad, T. J. Sweeney, fs'74, and Professor C. H. Ashton. The article below the photographs includes the following paragraph:

> On August 3 came word of the death that morning in Seattle of Professor C. H. Ashton. He and Mrs. Ashton were spending the summer, as they have done for several years, with their daughter Annette Ashton Bocker, '17, and family. Heart trouble caused his death. He had been a member of the faculty for 33 years, had served as chairman of the department of mathematics for

15 years, and was active in faculty social circles until ill health caused his semi-retirement a few years ago.

2. "Charles Hamilton Ashton, Scholarly Gentleman." *The Graduate Magazine*, vol. 35 (1936-1937), November 1936, no. 3, pp. 9-10. This excellent account of the life and work of Professor C. H. Ashton was written by Professor U. G. Mitchell.

3. Resolution in Memory of Professor Ashton. Adopted by the University Senate at a meeting held on November 4, 1936. Minutes of the University Senate.

4. Review of *College Algebra*, by Charles H. Ashton, assistant professor of mathematics in the University of Kansas, and Walter R. Marsh, headmaster Pingry school, Elizabeth, N. J. Pp. ix and 279. New York: Charles Scribner's Sons, 1907. *The Graduate Magazine*, vol. 6 (1907-1908), November 1907, no. 2, pp. 79-80. The review begins thus:

> A "College Algebra" was published during the summer months as the fourth book in the Marsh and Ashton Mathematical Series. In mechanical make-up it is uniform with its predecessors in the series--the "Analytic Geometry," the "Trigonometry," and the "Elementary Algebra." To those familiar with these books, that means about all that is desirable for such a textbook in the way of binding, typography, and quality of paper.

5. "News and Photograph of Madeline Ashton." *The University of Kansas Alumni Magazine*, vol. 60 (1961-1962), November 1961, no. 3, p. 20. Madeline Ashton, a daughter of Professor Ashton who lives in Illinois, has retired as a teacher of languages.

Bailey, E. H. S.

1. "K. U. Men Prominent in Sigma Xi National Scientific Society." *The Graduate Magazine*, vol. 23 (1924-1925), March 1925, no. 6, pp. 11-12.

2. "Some Recollections of the University Science Club." *The Graduate Magazine*, vol. 25 (1926-1927), December 1926, no. 4, pp. 8-10, and January 1927, no. 5, p. 23.

3. "Recollections of the University Science Club." Collected and edited by Professor E. H. S. Bailey. *The Graduate Magazine*, vol. 25 (1926-1927), May 1927, no. 9, pp. 18-20.

4. "Dr. Bailey Was Scientist, Teacher, Executive, Friend." By H. P. Cady. *The Graduate Magazine*, vol. 31 (1932-1933), June 1933, no. 9, pp. 15-16.

5. "Some Recollections of the University Science Club." Edited by Professor E. H. S. Bailey. *The Graduate Magazine*, vol. 25 (1926-1927), December 1926, no. 4, pp. 8-10.

6. "Recollections of the University Science Club. Continued from the December *Graduate Magazine*." Edited by Professor E. H. S. Bailey. *The Graduate Magazine*, vol. 25 (1926-1927), March 1927, no. 7, pp. 19-20.

7. "The Practical Side of Some Scientific Work in the University." *The Graduate Magazine*, vol. 5 (1906-1907), November 1906, no. 2, pp. 43-53. The second of a series of articles suggesting the practical relationship of the University to the welfare of the state.

Bayse, Arthur H.

1. "Dartmouth and the University." *The Graduate Magazine*, vol. 10 (1911-1912), April 1912, no. 7, pp. 266-267.

Black, Florence

1. "Florence Black, Good Scout." *The Graduate Magazine*, vol. 40 (1941-1942), September 1941, no. 1, p. 14. This article contains a short sketch of Miss Black as an outstanding teacher and as an outdoor person. It includes also a fine photograph of her.

2. "Miss Black on Dandelion Day." Robert Taft's *Across the Years on Mount Oread* contains a photograph [Taft 1, p. 167] which shows Professor Black digging dandelions on the first Dandelion Day, April 23, 1941. Professor Black is not identified by name, but the caption below the photograph reads as follows:

    After Seventy-Five Years. Another view of Dandelion Day; looking northeast from Marvin Grove toward the Memorial Union Building. Not only did students respond in large numbers to the call for workers but faculty members did also. We have visual evidence of the efficiency of the faculty in this photograph, for the lady nearest the camera (lower right-hand corner) is as adept in extracting cube roots as she is in extracting dandelion roots.

3. "At K. U. Fieldhouse--Look for Miss Black Front Row, Center." *Topeka Daily Capital*, March 15, 1955. This article is an account of Miss Black's interest in sports and outdoor life. It contains an excellent photograph of her.

4. "Professor Florence Black Retires From the Faculty." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), May 1960, no. 8, p. 15. Professor Black is included in the group photograph of the seven who retired from the faculty in June, 1960.

5. "In the Hinterland of Alaska Florence Black '13, g'21, Ph.D. '26." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), October 1962, no. 2, p. 18. Professor Black took a boat trip with members of her family to Alaska in the summer of 1962. A photograph shows her on the boat near a melting glacier.

6. "They're Loyal KU Fans." *Lawrence Daily Journal-World*, January 28, 1972. This article contains an account of the attendance of Florence Black and Wealthy Babcock at KU football and basketball games. There is a large photograph of Professors Black and Babcock, made at a basketball game in Allen Fieldhouse, with the following caption: "Lifetime Fans - Jayhawk star Bud Stallworth pens an autograph for two fans who've rarely missed a game in 50 years of viewing Kansas University football and basketball games--Florence Black, left, and Wealthy Babcock, center, both professors emerita of mathematics. Seated next to them is Barbara Craig, professor of French and Italian, also a cage fan."

7. "Life on the Prairie: Memories of the Cattle Range of Western Kansas." By Florence Black, with illustrations by Jeannot Barnes Seymour f'64. *Kansas Alumni*, vol. 73 (1974-1975), February 1975, no. 5, pp. 6-7.

Blackmar, F. W.

1. "F. W. Blackmar, Friendly Leader, Goes." By Professor David L. Patterson. *The Graduate Magazine*, vol. 29 (1930-1931), April 1931, no. 7, pp. 7-9. This is an account of the life and work of Professor Blackmar, who was head of the Department of Sociology from 1899 to 1926. He was the first Dean of the Graduate School, being appointed to this position in 1897 and continuing in it until 1922. He was a prolific author and wrote a number of important books on history, biography, and sociology. The article lists his important writings. Dean Blackmar was born November 3, 1854 in West Springfield, Pennsylvania, and died on March 30, 1931 in Lawrence.

   The article reads in part: "Professor Blackmar began his educational work as a teacher in San Jose, California. He was professor of mathematics in the University of the Pacific (Stockton, California) from 1882 to 1886." He received his Ph.D. degree from Johns Hopkins University in 1889.

Blake, Lucien Ira

1. For information about Blake, see C. K. Hyder's *Snow of Kansas*, pp. 186, 204, and 257.

2. Further information about Blake can be found in Robert Taft's *Across the Years on Mount Oread, 1866-1941*, pp. 33, 44 (photograph), 62, 162, and 175.

3. "Lucien Ira Blake." By C. S. Gleed. *The Graduate Magazine*, vol. 14 (1915-1916), May 1916, no. 8, pp. 230-233. This article reports the death of Professor Blake on May 11, 1916, and gives a brief account of his life and work, including the years after he left The University of Kansas in 1906.

Bush, Vannevar

1. *Science: The Endless Frontier. A Report to the President on a Program for Postwar Scientific Research.* By Vannevar Bush, Director of the Office of Scientific Research and Development. July 1945. Reprinted July 1960 by the National Science Foundation, Washington, D. C. xxvi + 220 pages.

Canfield, James Hulme

1. "Recollections." *The Graduate Magazine*, vol. 3 (1904-1905), February 1905, no. 5, pp. 163-172.

2. "Dedication of the Canfield Memorial Tablet." *The Graduate Magazine*, vol. 26 (1927-1928), June 1928, no. 9, p. 13.

3. "Professor James H. Canfield." By J. W. Gleed. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 117-120.

4. "A Columbia Colleague's Tribute." By Professor Calvin Thomas. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 120-129.

5. "He Loved the State and Was Loved by Its Children." By W. H. Carruth. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 129-131.

6. "As President of the Ohio State University." By Joseph Russell Taylor. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 131-133.

7. "A Memory and an Appreciation." By Kate Ridenour Lester, '84. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 133-135.

8. "One of Mr. Canfield's Friendships." By A. J. Felt. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 135-136.

9. "On His Heart the Name 'Kansas' Was Written." By Nicholas Murray Butler. *The Graduate Magazine*, vol. 8 (1909-1910), January 1910, no. 4, pp. 136-139.

Carruth, William Herbert

1. "The Single Board of Regents." *The Graduate Magazine*, vol. 5 (1906-1907), March 1907, no. 6, pp. 212-217.

2. "W. H. Carruth to Stanford." *The Graduate Magazine*, vol. 11 (1912-1913), March 1913, no. 6, p. 190.

3. "The University's Foundation Days." *The Graduate Magazine*, vol. 22 (1923-1924), March 1924, no. 6, pp. 5-8.

4. "Carruth As He Lived At K. U." By J. W. Gleed. *The Graduate Magazine*, vol. 25 (1926-1927), October 1926, no. 2, pp. 22-23.

## Catalogs, K. U.

1. Beginning with 1866-1867, The University of Kansas has issued a catalog for each academic year except 1942-1943, 1943-1944, and 1945-1946. A single, combined catalog was issued for the two years 1962-1964.

## Centennial, The University of Kansas

1. "Sturdy Folks--Our Founding Fathers." By Deane W. Malott. *Kansas Alumni*, vol. 64, no. 6, March/April 1966, pp. 10-15.

2. "Revolution of Today and Tomorrow." By Franklin D. Murphy. *Kansas Alumni*, vol. 64, no. 8, June 1966, pp. 10-14.

Chancellor Malott's paper contains the opening address given in the Inter-Century Seminar on "Man and the Future" held as a part of the University's centennial celebration. Chancellor Murphy's paper contains the closing address in the same Inter-Century Seminar.

## Distinguished Graduates of K. U.

1. "A Notable List." Compiled by E. H. S. Bailey. *The Graduate Magazine*, vol. 20 (1921-1922), November 1921, no. 2, p. 30. Professor Bailey lists W. S. Franklin, E. C. Franklin, V. L. Kellog, E. C. Case, Arnold Emch, C. E. McClung, C. A. Krause, E. V. McCollum, and R. E. Scamon and adds: "With one possible exception, all these men were at one time members of the faculty of the University of Kansas".

2. "K. U. Men at Mellon Institute." By Dr. F. F. Rupert. *The Graduate Magazine*, vol. 28 (1929-1930), February 1930, no. 5, pp. 8-10. This article describes especially the work of Professor Robert Kennedy Duncan, a member of the faculty of The University of Kansas and founder of the Mellon Institute, and Dr. Edward R. Weidlein, a graduate of the University of Kansas.

3. "Jayhawkers You Should Know." *The Graduate Magazine*, vol. 29 (1930-1931), January 1931, no. 4, p. 16. There are photographs and brief articles about the work of Alexandre Wetmore, '12; Jerome Beatty, fs'08; and Dr. C. E. McClung, p'92, '96, g'96.

4. "Study of Starred Men of Science Ranks Kansas High." *The Graduate Magazine*, vol. 29 (1930-1931), February 1931, no. 5, p. 2. This is a study of the University of Kansas graduates who were listed in the 1921 and 1927 editions of *American Men of Science*. There is a long list of the Kansas graduates who received stars in the 1921 and 1927 editions, and also a list of those who were "starred" in the original 1906 edition.

5. "Engineers Honor H. E. Riggs and E. B. Black." *The Graduate Magazine*, vol. 30 (1931-1932), December 1931, no. 3, p. 3.

6. "Some of Our University's Distinguished Graduates and Former Students." By Thornton Cooke, '93, President, Columbia National Bank, K. C., Missouri. *The Graduate Magazine*, vol. 33 (1934-1935), June 1935, no. 9, pp. 11-15. This is a comprehensive article about distinguished graduates in all fields. The article begins with an account of some of the distinguished graduates in the field of science, but it also includes playwrights, musicians, soldiers (Funston), and others.

7. "Michigan Engineers Honor Riggs." *The Graduate Magazine*, vol. 27 (1928-1929), February 1929, no. 5, p. 13. Henry Earle Riggs graduated from The University of Kansas in 1886. He was a professor of civil engineering and head of the department at the University of Michigan for many years. He gained national standing as an expert in railway valuation.

8. "[E. B. Black] Nominated President of A. S. C. E." *The Graduate Magazine*, vol. 40 (1941-1942), November 1941, no. 3, p. 9. E. B. Black, e'06, g'24, senior member of the firm of Black and Veatch in Kansas City, was nominated for President of the American Society of Civil Engineers.

9. "American Society of Civil Engineers Chooses Riggs." By F. A. Russell, e'08. *The Graduate Magazine*, vol. 36 (1937-1938), November 1937, no. 3, p. 9. Henry Earle Riggs, who graduated in 1886, has been nominated for President of A. S. C. E. This article gives a brief account of his life and work.

10. "The President's Message." (This is the message of Henry Earle Riggs, '86, President of the K. U. Alumni Association.) *The Graduate Magazine*, vol. 16 (1917-1918), November 1917, no. 2, pp. 35-39.

11. "The Thirty-Five Who Have Led K. U. Alumni." *The Graduate Magazine*, vol. 20 (1921-1922), April 1922, no. 7, pp. 3-5. The Alumni Association was organized in 1883, and this article gives information about all of the presidents up to 1922.

12. "Four Alumni, One Professor Starred." *The Graduate Magazine*, vol. 31 (1932-1933), March 1933, no. 6, p. 8. Four alumni and one faculty member (Professor Raymond C. Moore) were "starred" in the recently published edition of *American Men of Science*.

13. "Weidlein Takes Highest Honors." *The Graduate Magazine*, vol. 34 (1935-1936), January 1936, no. 4, p. 6. This article reports that Dr. Edward R. Weidlein, '09, g'10, has been awarded the Chemical Industry Medal and has been chosen president-elect of the American Chemical Society.

14. "General Funston's Reminiscences of the University." *The Graduate Magazine*, vol. 14 (1915-1916), December 1915, no. 3, pp. 67-72.

15. "Borah Was a Jayhawker." *The Graduate Magazine*, vol. 38 (1939-1940), February 1940, no. 6, p. 13. William E. Borah, fs'89, was a student in The University of Kansas from 1885 to 1887, but apparently did not graduate. This article has a photograph of Senator Borah and a brief account of his career. He was a senator from Idaho for many years and chairman of the Senate Foreign Relations Committee. On page 3 of the same number of *The*

*Graduate Magazine* we find an account of a student prank that involved Borah, who roomed at Professor Dyche's house at the time.

16. "Jayhawkers on A. S. C. E. Board." *The Graduate Magazine*, vol. 31 (1932-1933), February 1933, no. 5, p. 5. There is a small photograph which shows four Kansas graduates who are members of the Board of Directors of the American Society of Civil Engineering. The four are: E. B. Black, '06; E. P. Lupfer, '96; E. N. Noyes, '07; H. E. Riggs, '86.

17. "E. B. Black, e'06, President of the Alumni Association." *The Graduate Magazine*, vol. 26 (1927-1928), October 1927, no. 1, p. 13.

18. "Death of Ernest B. Black." *The Graduate Magazine*, vol. 48 (1949-1950), October 1950, no. 2, p. 24. E. B. Black, e'06, g'24, died at his home in Kansas City on July 4, 1949. This article gives an account of his life and work.

19. "A Pioneer in Biological Warfare." By Ken Postlethwaite. *The Graduate Magazine*, vol. 44 (1945-1946), December 1945, no. 4, p. 6. This article describes the war work of Dr. Cornelia M. Downs, '16, g'20, Ph.D. '24. She worked at Camp Detrick, Maryland, where she was in charge of a staff of 40 scientists and technicians.

20. "A Salute for 'Brig. Gen.' Cora Downs." *The University of Kansas Alumni Magazine*, vol. 54 (1955-1956), February 1956, no. 6, p. 10. This is an article about Dr. Down's study of tularemia in Alaska for the Air Force. There are photographs of Dr. Downs and Dr. Ted Metcalf, associate professor of bacteriology at K. U. Dr. Metcalf was a member of Dr. Down's party in Alaska. Both were members of a research project entitled "Biological Warfare and the Navy Supply System" which was carried out on the campus for the Office of Naval Research in the summer of 1952. G. B. Price was director of the project.

21. "Downs is Summerfield Professor." *The University of Kansas Alumni Magazine*, vol. 60 (1961-1962), June 1962, no. 9, p. 17. Dr. Cora Downs has been named "Summerfield Distinguished Professor of Bacteriology." The article contains a photograph of Dr. Downs and a brief account of her research on tularemia.

22. "Alvin McCoy Wins Pulitzer Prize." *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), May 1954, no. 8, p. 21. This is a brief account of the career of Alvin McCoy on the occasion of his winning of the Pulitzer Prize. A graduate of the University, he was Kansas correspondent for the *Kansas City Star*. He served as a war correspondent in the Pacific during World War II.

23. "Distinguished Alumni (Including Alvin S. McCoy) To Receive Citations." *The University of Kansas Alumni Magazine*, vol. 60 (1961-1962), May 1962, no. 8. pp. 9, 35. There is a photograph of McCoy on page 9 and a brief account of his career on page 35.

24. "No Longer a Monastery." By Alvin S. McCoy, '25, Kansas Correspondent, *Kansas City Star*. *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), September 1962, no. 1, pp. 8-9, 33. This is a speech given by McCoy on the world situation and the future of the University. There is also an excellent photograph of McCoy.

25. "He Soared High--The Kenneth Spencer Story." By Jim Tice. *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), June 1960, no. 9, pp. 7-9. Kenneth Spencer made a fortune from coal mining and from the Spencer Chemical Company, which he founded. He died on February 19, 1960 in Miami, Florida. This article describes his career and accomplishments. The Spencer Memorial Library was a gift from his wife in his memory.

Dresden, Arnold

1. "The Migration of Mathematicians." *American Mathematical Monthly*, vol. 49 (1942), pp. 415-429. This article contains an account of the many foreign mathematicians who came to the United States in the years before World War II. Most of them came in the 1930's, and most of them came from Europe. Many of them had fled from Germany as a result of persecutions by the Nazis. These immigrants from abroad greatly enriched American mathematics, but they came at a time when there were not enough positions for the native American mathematicians.

Dunlap, Charles Graham

1. "Dunlap's Life a Career of True Culture." By Chester Woodward, p'96. *The Graduate Magazine*, vol. 35 (1936-1937), December 1936, no. 4, pp. 10-11. This is an account of the life and work of Professor Dunlap, who joined the faculty in 1887, was chairman of the Department of English from 1893 until 1927, and died on September 27, 1936.

Dyche, Lewis Lindsay

1. For an account of Dyche's career, see C. K. Hyder's *Snow of Kansas*, pp. 175-179.

2. For a further account of Dyche's career, see Robert Taft's *Across the Years on Mount Oread, 1866-1941*, pp. 71-73.

3. "Lewis Lindsay Dyche." *The Graduate Magazine*, vol. 13 (1914-1915), February 1915, no. 5, pp. 143-146. This article contains an account of the life and work of Professor Dyche. The principal part of the article was written by Chancellor Strong and read by him at Professor Dyche's funeral. There is an excellent full-page photograph of Professor Dyche.

Ellsworth, Fred

1. "Our Amazing Chancellors"

   Part I. "Some Supernatural Hand." *Kansas Alumni*, vol. 63, no. 2, October 1964, pp. 6-9, 22-23.

   Part II. "Down the Hill, Coattails Flying." *Kansas Alumni*, vol. 63, no. 3, November 1964, pp. 12-13, 22.

   Part III. "The Chancellor Wore a Nightshirt." *Kansas Alumni*, vol. 63, no. 4, December 1964, pp. 10-11.

   Part IV. "Golden Years Not So Golden." *Kansas Alumni*, vol. 63, no. 5., January 1965, pp. 12-13, 26.

   Part V. "War and Aftermath." *Kansas Alumni*, vol. 63, no. 6, February 1965, pp. 12, 24.

   Part VI. "Latest in a Noble Line." *Kansas Alumni*, vol. 63, No. 7, March 1965, pp. 10-11, 33.

2. "The Hectic Birth of the Board of Regents"

   Part I. "Who's Running the Show?" *Kansas Alumni*, vol. 62, no. 5, January 1964, pp. 4-6.

   Part II. "Let's Take Another Vote." *Kansas Alumni*, vol. 62, no. 6, February 1964, pp. 6-8.

3. "Magic on Mt. Oread." *Kansas Alumni*, vol. 63, no. 6, February 1965, pp. 4-9. This article describes the life and work of Fred Ellsworth as Secretary of the Alumni Association.

4. "Ellsworth to Retire." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), October 1962, no. 2, p. 10. Fred Ellsworth announced his intention to retire on July 1, 1963 as Secretary of the Alumni Association.

Engel, E. F.

1. "Phi Beta Kappa, 40 Years Old at Kansas, Celebrates." *The Graduate Magazine*, vol. 28 (1929-1930), April 1930, no. 7, p. 8.

Faculty

1. "There Were Giants--and Whiskers--in Those Days." *The Graduate Magazine*, vol. 14 (1915-1916), March 1916, no. 6, pp. 163-164. There is a plate facing page 163 which contains photographs of all of the faculty in 1884 except Kate Stephens. The article describes these faculty members and tells what became of them.

2. "A Photograph of the Faculty Made in 1891 or 1892." *The Graduate Magazine*, vol. 37 (1938-1939), October 1938, no. 2, p. 17. For a list of those shown in this photograph, see [*The Graduate Magazine* 83].

Franklin, Edward Curtis

1. "Edward Curtis Franklin--A Scholar and a Gentleman." By William Allen White. *The Graduate Magazine*, vol. 26 (1927-1928), January 1928, no. 4, pp. 14-15. E. C. Franklin was a graduate of The University of Kansas, a member of its faculty, and later a member of the faculty of Stanford University for many years. He was a brother of W. S. Franklin, a physicist, who was a member of the faculty of Massachusetts Institute of Technology for many years.

2. "A Notable List." By Professor E. H. S. Bailey. *The Graduate Magazine*, vol. 20 (1921-1922), November 1921, no. 2, p. 30. This is a list of K. U. graduates in addition to present faculty members who are "starred" in the latest edition of *American Men of Science*. The list contains the names of E. C. Franklin and William Suddards Franklin, his brother.

3. "Dr. Ed Franklin, Distinguished Scientist, Kindly Gentleman, Dies at Palo Alto, California, Home." *The Graduate Magazine*, vol. 35 (1936-1937), February 1937, no. 6, p. 17. There is a photograph of Dr. E. C. Franklin and an announcement of his death on February 13, 1937. There is a short account of his life and work, with a full account promised later.

4. "Master of Work and Play Was Dr. E. C. Franklin, '88, g'92, Internationally Known Chemist, Who Died February 13 at Stanford." *The Graduate Magazine*, vol. 35 (1936-1937), May 1937, no. 9, p. 6. This is an account of the life and work of E. C. Franklin by one of his close friends, Chas. F. Scott. The article is accompanied by a photograph.

Franklin, William Suddards

1. "A Notable List." By Professor E. H. S. Bailey. *The Graduate Magazine*, vol. 20 (1921-1922), November 1921, no. 2, p. 30. This list records the fact that W. S. Franklin, a member of the faculty of Massachusetts Institute of Technology, has received a star in the latest edition of *American Men of Science*.

2. "Recollections of William Suddards Franklin." By Professor E. L. Nichols. *The Graduate Magazine*, vol. 29 (1930-1931), November 1930, no. 2, pp. 7-8.

Fraser, John

1. "Recollections of John Fraser." By S. A. Riggs. *The Graduate Magazine*, vol. 4 (1905-1906), January 1906, no. 4, pp. 117-123. This article by Riggs contains an account of the life, education, and career of John Fraser.

Riggs had been a student under John Fraser at Jefferson College in Canonsburg, Pennsylvania, where Fraser had been appointed Professor of Mathematics and Astronomy in 1855. The article describes him as a highly successful teacher of mathematics, and it puts him in a much better light than do most accounts, and, in particular, than does an account by Ephraim Miller. There appears to be one error in Riggs' account of Fraser. Fraser became professor of mathematics and astronomy in Jefferson College in 1855, and he remained there until he left for the Civil War. At the end of the war, Fraser was elected to the presidency of the Pennsylvania Agricultural College at Bellefonte, and from there he came to The University of Kansas.

2. "Chancellor Fraser as His Students Knew Him." By Hannah Oliver. *The Graduate Magazine*, vol. 6 (1907-1908), May 1908, no. 8, pp. 282-288. This article supplements nicely the earlier articles on Fraser by Ephraim Miller and S. A. Riggs. It contains a great deal on the personal side, and also it tells something about him as a mathematician and a teacher. He taught in The University of Kansas while he was chancellor.

*The Graduate Magazine*

1. "Portrait of Amos A. Lawrence." *The Graduate Magazine*, vol. 30 (1931-1932), November 1931, no. 2, p. 2.

2. Catalogue Number. *The Graduate Magazine*, vol. 12 (1913-1914), December 1913, no. 3, pp. 1-175. This Catalogue Number contains the names and degrees of all graduates of the University. There are two divisions in the Catalogue Number: one gives all graduates by year and school; the other gives an alphabetical list of all graduates with cross references to the year and school in which degrees were obtained.

3. "Launching an Alumni Magazine at Kansas." *The Graduate Magazine*, vol. 26 (1927-1928), October 1927, no. 1, pp. 5-7. This article contains a complete history of the Alumni Association and of the founding of *The Graduate Magazine*. On pages 7-9 of this same number, we find the articles listed below; they deal with the early history of *The Graduate Magazine*:

    "Some Confessions of the First Editor." By R. D. O'Leary, '93, Professor of English.

    "Developing the Magazine by Trial and Error Method." By L. N. Flint, '97, First Executive Secretary of the Alumni Association; Chairman of the Department of Journalism.

    "Recording War Activities of Alumni." By Agnes Thompson, '96, g'97, Alumni Secretary 1916-1920.

    "When the Grad was 'Made Up' Backwards." By Alfred G. Hill, '17, Alumni Secretary 1920-1924; Co-Publisher *Arkansas City Traveler*.

4. "Proposed Sale of Printing Plant." *The Graduate Magazine*, vol. 10 (1911-1912), January 1912, no. 4, pp. 153-155. This article describes the sale of the Alumni Association's printing plant to the University for $5,000.

5. "Out of Debt." *The Graduate Magazine*, vol. 11 (1912-1913), October 1912, no. 1, p. 21. This news item explains that the Alumni Association has completed payment for the Mergenthaler linotype which it bought and eventually sold to the University.

6. "Editorial: A Serious Need of Adjustment." *The Graduate Magazine*, vol. 6 (1907-1908), May 1908, no. 8, pp. 289-292.

7. "Editorial: Three State Universities in Kansas." *The Graduate Magazine*, vol. 7 (1908-1909), March 1909, no. 6, pp. 227-234.

8. "Editorial: Playing Politics with the University." *The Graduate Magazine*, vol. 9 (1910-1911), March 1911, no. 6, pp. 219-220.

9. "The Single Board Idea." *The Graduate Magazine*, vol. 9 (1910-1911), March 1911, no. 6, pp. 229-233.

10. The Campaigns for the Mill Tax and for a Women's Dormitory. *The Graduate Magazine*, vol. 10 (1911-1912), October 1911, no. 1, pp. 1-8; vol. 11 (1912-1913), October 1912, no. 1, pp. 38-39; January 1913, no. 4, pp. 105-107, 117-119; June 1913, no. 9, pp. 273-275.

11. "One Salaried Board to be in Charge." *The Graduate Magazine*, vol. 11 (1912-1913), February 1913, no. 5, pp. 137-141.

12. "*Board of Administration*." *The Graduate Magazine*, vol. 11 (1912-1913), May 1913, no. 8, pp. 260-261.

13. "New Regents." *The Graduate Magazine*, vol. 11 (1912-1913), March 1913, no. 6, p. 190.

14. Articles by McClung, Kellogg, and others on salaries at The University of Kansas. *The Graduate Magazine*, vol. 11 (1912-1913), April 1913, no. 7, pp. 208-210; May 1913, no. 8, pp. 249-258.

15. "Smoking on the Campus." *The Graduate Magazine*, vol. 12 (1913-1914), January 1914, no. 4, p. 254; February 1914, no. 5, p. 286.

16. "Salary Schedule Adopted by the Board of Administration." *The Graduate Magazine*, vol. 12 (1913-1914), May 1914, no. 8, p. 385.

17. "Actions of the Board of Administration." *The Graduate Magazine*, vol. 13 (1914-1915), May 1915, no. 8, p. 253. The Board of Administration has removed Arvid Olin from his position as Dean of the School of Education and also C. S. Skilton from his position as Dean of the School of Fine Arts. Also, the Board of Administration has promoted C. H. Ashton and U. G. Mitchell in mathematics.

18. "Actions of the Board of Administration." *The Graduate Magazine*, vol. 14 (1915-1916), March 1916, no. 6, p. 176. The Board of Administration is really running the University. It is not clear what function Chancellor Strong has in the operation of the University.

19. "The New Board." *The Graduate Magazine*, vol. 16 (1917-1918), October 1917, no. 1, pp. 16-17.

20. "The Alumni Visitors' Report." *The Graduate Magazine*, vol. 16 (1917-1918), October 1917, no. 1, pp. 22-24.

21. "Visitors' Report." *The Graduate Magazine*, vol. 16 (1917-1918), June 1918, no. 9, pp. 297-300.

22. "The College Population in Kansas." *The Graduate Magazine*, vol. 11 (1912-1913), January 1913, no. 4, front cover.

23. "A New Committee." *The Graduate Magazine*, vol. 17 (1918-1919), December 1918, no. 3, p. 80. This article describes the establishment of a faculty budget committee for the College, based on the committee system.

24. "A New Day." *The Graduate Magazine*, vol. 17 (1918-1919), November 1918, no. 3, last cover page. This notice describes a constitutional amendment to enable the legislature to levy a mill tax for the support of the state educational institutions.

25. "What's the Matter With Kansas?" By Helen Perry Edwards, '96. *The Graduate Magazine*, vol. 17 (1918-1919), May 1919, no. 8, pp. 227-230. Mrs. Edwards begins by acknowledging that something is wrong with the University. She believes that the trouble is emphasis on scholarship and loss of the Kansas spirit.

26. "The State Board of Administration." *The Graduate Magazine*, vol. 22 (1923-1924), March 1924, no. 6, pp. 10-14. This article is an analysis of the "official survey concerning Kansas Higher Educational Institutions, made under the supervision of the U. S. Bureau of Education". See page 8 of the April number for a correction to the article.

27. "A Regents Plan is Adopted; Legislature Supplants Control of Educational Institutions by Board of Administration with Supervision by Non-Paid Board." *The Graduate Magazine*, vol. 23 (1924-1925), March 1925, no. 6, pp. 3-5.

28. "Dismissed 'At Pleasure'--Reinstated; Chancellor Lindley's Removal by Retiring Governor Davis Stirs State; Immediate Reinstatement at Request of Governor Paulen." *The Graduate Magazine*, vol. 23 (1924-1925), January 1925, no. 4, pp. 3-5.

29. "The University: Maintenance Reduced." *The Graduate Magazine*, vol. 9 (1910-1911), March 1911, no. 6, pp. 227-229.

30. "Brand New and a Perfect Fit." *The Graduate Magazine*, vol. 14 (1915-1916), December 1915, no. 3, pp. 78-80. This is a description of the University constitution that was begun in 1912 and finally approved in November 1915.

31. "About University Professors." *The Graduate Magazine*, vol. 18 (1919-1920), February 1920, no. 5, pp. 132-133. This is an extract from the annual report for 1918-1919 of President Nicholas Murray Butler of Columbia University.

32. "The Million Dollar Drive." *The Graduate Magazine*, vol. 18 (1919-1920), March 1920, no. 6, p. 162.

33. "J. N. Van der Vries on Leave." *The Graduate Magazine*, vol. 10 (1911-1912), January 1912, no. 4. p. 148.

34. "Seeing K. U." By Lydia E. Cook, '14. *The Graduate Magazine*, vol. 12 (1913-1914), October 1913, no. 1, pp. 8-12. This article contains a description and a photograph of the Mathematics and Philosophy Library in the present room 103 Strong Hall.

35. "The First and the Fiftieth: A Contrast in Opening Exercises." By Helen Rhoda Hoopes, '13. *The Graduate Magazine*, vol. 14 (1915-1916), October 1915, no. 1, pp. 4-11.

36. "Climbing Mount Oread in Crinolines on a Windy Day was a Difficult Feat. A Drawing Reprinted from the *Kansas City Star*." *The Graduate Magazine*, vol. 14 (1915-1916), November 1915, no. 2, p. 41. "The article by Helen Rhoda Hoopes in the October *Graduate Magazine*, describing the opening of the University fifty years ago, inspired the artist for the *Kansas City Star* to draw this spirited picture accompanying the article as reprinted in the *Star*."

37. "Professor John J. Wheeler Has Been Appointed University Marshal." *The Graduate Magazine*, vol. 15 (1916-1917), October 1916, no. 1, p. 22.

38. "Leave for Professor John N. Van der Vries for War Service." *The Graduate Magazine*, vol. 16 (1917-1918), February 1918, no. 5, p. 147.

39. "Changes in the Faculty." *The Graduate Magazine*, vol. 17 (1918-1919), October 1918, no. 1, p. 19. Mrs. Alice Lefschetz received an appointment, probably as a temporary war instructor. Also, Florence Black and Anna Marm have been appointed instructors in mathematics.

40. "The Summer Session." *The Graduate Magazine*, vol. 1 (1902-1903), June 1903, no. 9, p. 359. This item describes the opening of the first Summer Session, with W. H. Carruth as Director.

41. "Solomon Lefschetz Awarded the Bordin Prize." *The Graduate Magazine*, vol. 18 (1919-1920), January 1920, no. 4, p. 109.

42. "Mathematics and K. U." By G. Baley Price. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), November 1953, no. 3, pp. 6, 30. This article contains a photograph of Professors Nachman Aronszajn and Gustave Choquet and a group photograph with excellent likenesses of Professor and Mrs. Solomon Lefschetz, Dean E. B. Stouffer, and Professors G. W. Smith, Wealthy Babcock, G. B. Price, and Florence Black.

43. Summary of the University's Building Program. *The Graduate Magazine*, vol. 28 (1929-1930), March 1930, no. 6. This number of *The Graduate Magazine* describes the new Snow Hall and other new buildings built during the administration of Chancellor Lindley. The Memorial Union is in use, but the top floor has not been finished and cannot be used in its present state. This number of *The Graduate Magazine* summarizes the present state of the building program on the campus.

44. "Special Library Number." *The Graduate Magazine*, vol. 24 (1925-1926), April 1926, no. 7, pp. 3-14. This number of *The Graduate Magazine* contains the following articles about the library:

    (1) "The New Watson Library Building," by Earl N. Manchester, Director of Libraries

    (2) "Development of the Library," by Carrie M. Watson, Librarian Emerita

    (3) "Some Gifts to the Library," by Clara S. Gillhan, Reference Librarian

    (4) "Library Personnel," by Maud Smelser, Accessionist

    (5) Several short recollections and reminiscences

    (6) Photograph of Earl N. Manchester, Director of Libraries

45. "Legislature Grants Replacement of Snow Hall." *The Graduate Magazine*, vol. 25 (1926-1927), March 1927, no. 7, p. 7.

46. "Professor Wheeler, Marshal." *The Graduate Magazine*, vol. 26 (1927-1928), June 1928, no. 9, p. 5. This is a short news item about Professor Wheeler's activities as University Marshal at the recent commencement.

47. "Chancellor and Deans Review Work and Needs of University." *The Graduate Magazine*, vol. 27 (1928-1929), January 1929, no. 4, pp. 5-7.

48. "Summerfield Scholarship Project Gets Under Way." *The Graduate Magazine*, vol. 28 (1929-1930), December 1929, no. 3, pp. 9-10.

49. "What the University Presents as Its Budget Requirements." *The Graduate Magazine*, vol. 29 (1930-1931), January 1931, no. 4, p. 3.

50. "University Will Remain Open Two More Years." *The Graduate Magazine*, vol. 29 (1930-1931), March 1931, no. 6, p. 3. This article reports on the appropriations made by the state legislature for the next biennium.

51. "Watkins Memorial Hospital." *The Graduate Magazine*, vol. 30 (1931-1932), February 1932, no. 5, pp. 4-5. On these pages we have a photograph of Mrs. Elizabeth M. Watkins and a photograph of the Watkins Memorial Hospital which she gave to The University of Kansas for the use of its students. There is a presentation statement by Mrs. Watkins and a reply by Chancellor Lindley. The gift of this hospital is another example of the benefactions that have blessed the University from the beginning.

52. "Regents Submit 'Depression Budget' for State Schools." *The Graduate Magazine*, vol. 31 (1932-1933), December 1932, no. 3, p. 5.

53. "Easy Lessons on University Affairs--So the Alumni May Know." *The Graduate Magazine*, vol. 31 (1932-1933), January 1933, no. 4. pp. 1, 4-9. This is a comprehensive summary of facts about the University. There are tables and graphs which present in easy and striking form the course of affairs in the University; the enrollment has climbed sharply.

54. "Legislature Cuts 25%-Plus From University Budget." *The Graduate Magazine*, vol. 31 (1932-1933), March 1933, no. 6, p. 5. This article is a report on the appropriations made by the legislature for the next two years.

55. "University Goes Forward on Ultra-Economical Basis." *The Graduate Magazine*, vol. 32 (1933-1934), October 1933, no. 1, p. 5. This article describes the University's budget for the next year. Salaries have been reduced by amounts ranging from 15 to 25 percent, and the chancellor's salary has been reduced by 30 percent. There were many other economies. These measures were necessitated by the reduction in appropriations made by the legislature in the spring of 1933.

56. "Dean Brandt of the College is Taken by Death." *The Graduate Magazine*, vol. 32 (1933-1934), November 1933, no. 2, front cover. This article describes the death of Dean Brandt on October 28, 1933. There is a brief account of his life and a photograph.

57. "In Memoriam: Luther North Lewis, fs'86." *The Graduate Magazine*, vol. 32 (1933-1934), November 1933, no. 2, pp. 6-7. Mr. Lewis died and left a bequest of $300,000 to the University. He inherited a lumber business from his father. He sold this lumber business to Carl Friend in 1909. Lewis Hall is undoubtedly named for Mr. Lewis.

58. "Officials, Teachers, Students Pay Homage to Dean Brandt." *The Graduate Magazine*, vol. 32 (1933-1934), December 1933, no. 3, p. 5. This is an account of a memorial service for Dean Joseph Granger Brandt held in Fraser Chapel on November 21, 1933. The article summarizes talks made at the memorial service. Among other things, Chancellor Lindley said:

> I recall vividly the spirit of humility with which he assumed the assignment as dean. His attitude across the years has been that of the first president of Johns Hopkins--a great "inside" man. He did not seek public contacts, nor public praise for his work.

59. "K. U. Men Had Parts in Developing Nelson's Great Art Dream." *The Graduate Magazine*, vol. 32 (1933-1934), January 1934, no. 4, pp. 2-4. This article contains a picture of the William Rockhill Nelson Art Museum, and an account of the part played by K. U. men. Chancellor Lindley was Chairman of the Board of University Presidents. The Nelson Art Gallery was dedicated on December 10-11, 1933.

60. "Hail to These Great Souls--and Farewell." *The Graduate Magazine*, vol. 33 (1934-1935), October 1934, no. 1, pp. 2-3. This number is a tribute to the faculty members who have died recently. The article here is, however, chiefly a tribute to Dr. Frank Strong. There is a photograph of Chancellor Strong made toward the latter part of his life on the front cover of this number of *The Graduate Magazine*.

61. "A Backward Glance." By William Allen White. *The Graduate Magazine*, vol. 33 (1934-1935), October 1934, no. 1, pp. 3-4. This is an appreciation by William Allen White of the contributions of Chancellor Frank Strong to The University of Kansas.

62. "College Dean, Paul B. Lawson." *The Graduate Magazine*, vol. 33 (1934-1935), October 1934, no. 1, p. 11. Reprinted by permission from the *Kansas City Star*, September 9, 1934. Paul B. Lawson was acting dean during 1933-1934, and he was made dean of the College in 1934.

63. "University Stretches Its Curtailed Resources." *The Graduate Magazine*, vol. 33 (1934-1935), January 1935, no. 4, p. 3. This page is taken from Chancellor Lindley's biennial report in which he presents his budget requests for the next biennium. The requests are essentially identical with the appropriations made by the legislature for the current biennium. The University received (in Lawrence) $615,000 for salaries in 1933-1934 and 1934-1935, and it has requested $615,000 for each of the next two years. The report repeats all of the statements made about the University's difficulties in the past. Most of the same difficulties still exist today and are being restated frequently.

64. "University Operating Funds Set at Same Level." *The Graduate Magazine*, vol. 33 (1934-1935), February 1935, no. 5, p. 4. This note reports on appropriations by the state legislature. The University received the amount requested for salaries (the same as during the last biennium), $16,250 less for maintenance, and $15,000 more for the Geological Survey than during the last biennium.

65. "K. U. Center of Things Moves West." *The Graduate Magazine*, vol. 22 (1923-1924), January 1924, no. 4, p. 3. This article describes the completion of the last part of Strong Hall.

66. "Legislature Will Decide on Appropriations Soon." *The Graduate Magazine*, vol. 35 (1936-1937), February 1937, no. 6, p. 3.

67. "Slight Relief Granted on University Operating Problem." *The Graduate Magazine*, vol. 35 (1936-1937), March 1937, no. 7, pp. 2-3. This article contains a statement of the appropriations made by the state legislature for the University for the next biennium. The cuts brought on by the Depression had not been restored in 1937. For example, in 1929-1930 the

University received $819,000 for salaries and wages, and in 1937-1938 it will have $675,000 for the same salaries and wages. Other items also are below the former figures, as are the totals.

68. "Baker is New Librarian." *The Graduate Magazine*, vol. 27 (1928-1929), October 1928, no. 1, p. 26. This is a short news account of the resignation of Earl N. Manchester as Director of Libraries and the appointment of Charles M. Baker as his successor.

69. "John N. Van der Vries Resigns." *The Graduate Magazine*, vol. 17 (1918-1919), March 1919, no. 6, p. 178. This news item reads: "John N. Van der Vries, of the department of mathematics has resigned his position here to become connected with the National Chamber of Commerce in Chicago." Professor Van der Vries went on leave on February 1, 1918 and left the University at that time.

70. "Dean Arant Leaves Kansas." *The Graduate Magazine*, vol. 26 (1927-1928), June 1928, no. 9, p. 20. "One of the outstanding figures to leave the Kansas faculty this year is Dean W. H. Arant of the School of Law."

71. "K. U. Loses Deans to Other Schools." *The Graduate Magazine*, vol. 21 (1922-1923), May 1923, no. 8, p. 7. This article announces the resignations of two deans and states that many others have offers and are expected to go:

> The resignation of Raymond A. Kent, dean of the School of Education and director of the summer session and Anne Dudley Blitz, dean of women, were received early in May. Dr. Kent will become dean of the College of Liberal Arts of Northwestern University. Dean Blitz will become dean of women at her alma mater, Minnesota University. In both cases the salaries in the new positions were distinctly larger than those paid at the University of Kansas.

72. "Dean Kelly and Dean Butler Resign." *The Graduate Magazine*, vol. 21 (1922-1923), June 1923, no. 9, p. 5. This article announces the resignations of the two deans:

> Two additional important resignations of the University of Kansas deans have been announced in the past month. F. J. Kelly, dean of administration, will take a similar position at the University of Minnesota, starting with a salary distinctly in advance of the one he has received at Kansas. Harold L. Butler, dean of the School of Fine Arts, has accepted a similar position at Syracuse University.

73. "Appropriations Include New Building." *The Graduate Magazine*, vol. 39 (1940-1941), March-April 1941, nos. 7-8, p. 11. The legislature appropriated funds to build Lindley Hall. Appropriations for salaries and wages were the following: 1940-1941, $710,000; 1941-1942, $766,000; 1942-1943, $766,000. In discussing the appropriation for salaries and wages for the 1941-1943 biennium, the article states:

> The salary fund was increased by $56,000, which is slightly less than 8 percent. The amount this year is $151,000 a year

more than the low record grant of the '33 and '35 legislatures--$615,000 a year. It is still $53,000 a year short of the amount granted in '29 and '31 which was then inadequate to bring the University of Kansas up to a level with other universities of the same rank and size in the mid-West area. The legislature has restored most of the salary cuts to state and county officers, and in some cases has made increases. Governor Ratner has pressed the need for restoration of salary budgets. However, the legislature recoils abruptly when salary increases are mentioned.

74. "Charles S. Skilton, Master Musician, Passes." *The Graduate Magazine*, vol. 39 (1940-1941), March-April 1941, nos. 7-8, pp. 12-13.

75. "In Memory of Alberta Corbin." By Olin Templin. *The Graduate Magazine*, vol. 39 (1940-1941), March-April 1941, nos. 7-8, pp. 13-14.

76. "George O. Foster, Student Friend, Able Leader." *The Graduate Magazine*, vol. 41 (1942-1943), October 1942, no. 2, pp. 6-7. Professor E. F. Engel followed Professor Olin Templin as Registrar, and George O. Foster succeeded Professor Engel. "His continuing adoration for the late Professor Ephraim Miller was an example of his loving nature."

77. "H. P. Cady, Great Scientist, Teacher." By Arthur W. Davidson. *The Graduate Magazine*, vol. 42 (1943-1944), November 1943, no. 3, pp. 4-5, 17. Professor Cady died on May 26, 1943.

78. "Carrie M. Watson, Pioneer Librarian." By Margaret Lynn. *The Graduate Magazine*, vol. 42 (1943-1944), December 1943, no. 4, pp. 6-7.

79. "William Allen White and K. U." By Ruth Jane Carver Gagliardo, '22. *The Graduate Magazine*, vol. 42 (1943-1944), January 1944, no. 5, pp. 6-7. White died on January 29, 1944.

80. "Appropriations as Requested." *The Graduate Magazine*, vol. 43 (1944-1945), January 1945, no. 5, p. 4. The University of Kansas received $808,970 for salaries and wages for each of the years 1943-1944 and 1944-1945. The legislature appropriated $977,218 for salaries and wages for each of the years 1945-1946 and 1946-1947. These appropriations for salaries and wages represent an increase of 20.8 percent over those for the 1943-1945 biennium.

81. "Hoch Auditorium." *The Graduate Magazine*, vol. 26 (1927-1928), November 1927, no. 2, p. 21. This news article contains a photograph of the dedication of Hoch Auditorium, held on October 14, 1927.

82. "University's Greatest Bequest Comes in Will of Elizabeth Miller Watkins." *The Graduate Magazine*, vol. 37 (1938-1939), June 1939, no. 10, pp. 11-12. This article describes all of Mrs. Watkins' gifts to the University; she died on June 1, 1939.

83. "Forty-Six or Seven Years Ago This Picture Was Taken." *The Graduate Magazine*, vol. 37 (1938-1939), October 1938, no. 2, p. 17. This picture, made either in 1891 or 1892, is an excellent group photograph which shows the following members of the faculty: E. F. Engel, C. G. Dunlap, Erasmus Haworth, L. E. Sayre, A. W. Wilcox, D. H. Robinson, A. G. Canfield, E. M. Hopkins,

L. I. Blake, A. W. Shepherd, E. D. Adams, S. R. Boyce, W. H. Carruth, Olin Templin, E. C. Murphy, F. O. Marvin, S. W. Williston, H. B. Newson, E. H. S. Bailey, Hannah Oliver, Chancellor F. H. Snow, Carrie Watson, Ephraim Miller, Eugenie Galloo, and M. W. Sterling.

84. "He Came on Trial and Remains After Fifty Years of Service." By Marvin Goebel. *The Graduate Magazine*, vol. 38 (1939-1940), December 1939, no. 4, pp. 2, 21-23. An account of the many contributions of Edwin M. Hopkins.

85. "A Master Sportsman Has Completed His Assignment." *The Graduate Magazine*, vol. 38 (1939-1940), December 1939, no. 4, pp. 4-5. This article announces the death of Dr. James Naismith, inventor of the game of basketball, on November 28, 1939.

86. "In Memory of Miss Stanton." By Eugenie Galloo. *The Graduate Magazine*, vol. 39 (1940-1941), March-April 1941, nos. 7-8, pp. 14-15. Miss Stanton, a teacher of romance languages, died on January 4, 1941.

87. "Heads Design Department." *The Graduate Magazine*, vol. 40 (1941-1942), October 1941, no. 2, p. 13. Miss Marjorie Whitney has been made chairman of the Department of Design, following the death of Miss Rosemary Ketcham, who died in 1940.

88. "Miss Eugenie Galloo, g'94, died on August 23, 1941." *The Graduate Magazine*, vol. 40 (1941-1942), October 1941, no. 2, p. 21. Miss Galloo had taught French at the University since 1892.

89. "Memories of Miss Galloo." *The Graduate Magazine*, vol. 40 (1941-1942), December 1941, no. 4, p. 22.

90. "Miss Alice Winston, a Member of the K. U. English Department Faculty Since 1906, Died January 30, 1943." *The Graduate Magazine*, vol. 41 (1942-1943), January 1943, no. 5, p. 22.

91. "Aunt Carrie Watson, Noble Woman." *The Graduate Magazine*, vol. 41 (1942-1943), May-June 1943, nos. 8-9, p. 34. Carrie M. Watson, for many years University Librarian, died on June 27, 1943.

92. "William Savage Johnson Is Gone." *The Graduate Magazine*, vol. 41 (1942-1943), November 1942, no. 3, p. 5. Professor Johnson, formerly Chairman of the Department of English, died on December 15, 1942.

93. "Hannah Oliver is Gone." *The Graduate Magazine*, vol. 45 (1946-1947), March-April 1947, no. 7, p. 24. Miss Oliver, who was born in England, died on May 19, 1947, at age 95. She taught Latin for many years.

94. "Death of Burdick, Hopkins." *The Graduate Magazine*, vol. 44 (1945-1946), May-June 1946, no. 8, p. 27. Dr. William L. Burdick, for many years Dean of the School of Law and Vice-Chancellor of the University, died on June 11, 1946. Dr. Edwin M. Hopkins, Professor of English since 1889, died on June 13, 1946.

95. "It's Another Kansas-Missouri Homecoming." *The Graduate Magazine*, vol. 40 (1941-1942), November 1941, no. 3, front cover and p. 5. Dean Gilbert Ulmer was appointed homecoming chairman by Chancellor Malott.

96. "What Makes Every Student Tick." *The Graduate Magazine*, vol. 43 (1944-1945), September 1944, no. 1, p. 7. Dr. Gilbert Ulmer, assistant dean of the College and chairman of the committee on new student orientation, explains in this article some of the plans for the coming year.

97. "New Temporary Dorm." *The Graduate Magazine*, vol. 45 (1946-1947), December 1946, no. 4, p. 2. There is a picture of Oread Hall, which was new by the stadium in November 1946. Although listed as temporary, it provided the offices for all assistant instructors in mathematics until 1975.

98. "New Director, John Maxon, Will Have University Museum of Art Serve State." *The Graduate Magazine*, vol. 47 (1948-1949), May 1949, no. 8, p. 8. This article shows a photograph of John Maxon and describes his reorganization of the Art Museum in Spooner Hall.

99. "The University Flowered Under Chancellor Malott." By Roy Roberts. *The University of Kansas Alumni Magazine*, vol. 49 (1950-1951), February 1951, no. 6, pp. 6-8. This article describes the accomplishments of Chancellor Malott during his term as chancellor. There is an excellent full-page photograph of Chancellor and Mrs. Malott.

100. "Needed: More Babies by College Folks." *The University of Kansas Alumni Magazine*, vol. 49 (1950-1951), March 1951, no. 7, p. 26. This article is a report on the number of children of graduates of The University of Kansas. The number of children is exceptionally low--not high enough to replace the parents.

101. "You Could Get Immortality Cheap in Those Days." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), October 1951, no. 2, pp. 10-11. "The stories of Spooner and Carruth Halls, and Old Fowler Shops, and the Men Who Built Them."

102. "The Watkins Story: Wise Philanthropy." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), November 1951, no. 3, pp. 6-7, 10. "The story of Mrs. Elizabeth M. Watkins' generous gifts to the University."

103. "Group Gifts Enriched University." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), December 1951, no. 4, pp. 6-7, 32-33. This article describes group gifts that included Danforth Chapel, the Campanile, Military Science Building, and Alumni Place with Templin Hall.

104. "Logan Clendening and the Medical History Library." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), January 1952, no. 5, pp. 8-9. "More than Priceless Books--A Fascinating Museum of Medicine." Fourth in a series on gifts to the University.

105. "A Little Planning--A Lot of Happiness." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), February 1952, no. 6, p. 5. The Gift of Rose Morgan: "Morgan Place for Visiting Professors and Morgan Collection in Library will be living reminders of the way an individual may extend influence for good through future years."

106. "Summerfield Scholars." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), May 1952, no. 8, pp. 6-7. This is an account of the gift from Solon E. Summerfield that established the Summerfield Scholarships.

107. "Some Opening Remarks." By Fred Ellsworth. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), March 1954, no. 7, p. 3. These opening remarks comment on the death of Dean Paul B. Lawson. The photograph on the front cover is of Dean Lawson. He died on March 30, 1954.

108. "The Paul Lawson I Knew." By John H. Nelson, Dean of the Graduate School. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), March 1954, no. 7, p. 10. This is a moving tribute to Dean Lawson and his services to the University of Kansas. This article contains a photograph of Dean Lawson seated at his desk.

109. "A Young Jayhawker Takes College Helm." By John Stewart Smith, j'48, Managing Editor of the Alumni Magazine. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), March 1954, no. 7, p. 7. This is an announcement of the appointment of George R. Waggoner, age 38, to succeed Paul B. Lawson as Dean of the College. There is a group photograph of Dean Waggoner and his family.

110. "Learn to Budget Your Time at College." By George R. Waggoner, '36, g'39, Dean of the College. *The University of Kansas Alumni Magazine*, vol. 53 (1954-1955), September 1954, no. 1, pp. 6-7. Dean Waggoner advises new students to learn to budget their time and to learn self discipline.

111. "Name Science Building Malott Hall." *The University of Kansas Alumni Magazine*, vol. 53 (1954-1955), November 1954, no. 3, pp. 8-10. This is the address President Deane W. Malott of Cornell University gave on the occasion of the dedication of Malott Hall on November 5, 1954.

112. "Experiment in Brain Power." By Francis H. Heller, Associate Dean, College of Liberal Arts and Sciences. *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), September 1957, no. 1, pp. 8-9, 22-23. This is a description of the beginning of Dean Waggoner's Honors Program. On page 9 there is a photograph of Dean Heller and a brief account of his career.

113. "The Meaning of СПУТНИК(Sputnik)." *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), November 1957, no. 3, pp. 10-11. Under the general title above, we find the following four articles:

"The Scientific Implications," by L. W. Seagondollar and G. G. Wiseman, Associate Professors of Physics (p. 10)

"We Are Being Surpassed," by Richard W. Porter, e'34, Chairman, Technical Panel on Earth Satellites (p. 10)

"The Political Implications," by Clifford P. Ketzel and Roy D. Laird, Assistant Professors of Political Science (p. 11)

"The Educational Implications," by Chancellor Franklin D. Murphy [From the Remarks of the Retiring Chairman of the American Council on Education, October 11, 1957] (p. 11)

114. "Roy A. Roberts Explains Why He Decided to Endow Two Professorships." *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), June 1958, no. 9, p. 9. In a letter to Chancellor Murphy, Mr. Roberts explains why he decided to make a gift to the University of $200,000 to endow two Distinguished Professorships "in the fields of science and mathematics and the humanities".

115. "More Distinguished Professorships." *The University of Kansas Alumni Magazine*, vol. 57 (1958-1959), October 1958, no. 2, p. 5. The Roy A. Roberts Distinguished Professorships must be used to attract new scholars to the faculty. Dr. Murphy has established three additional Distinguished Professorships, two in the name of the late Solon E. Summerfield and one in the name of the late Elizabeth M. Watkins. Each is supported by the equivalent of an endowment of $100,000. These three may be awarded to professors already on the faculty.

116. "A World Figure." *The University of Kansas Alumni Magazine*, vol. 57 (1958-1959), October 1958, no. 2, p. 5. Professor Raymond C. Moore has been appointed the first Summerfield Distinguished Professor. This article is a brief account of his life and accomplishments. Professor Moore was the first of all the Distinguished Professors.

117. "Hall, Michener Distinguished Professors." *The University of Kansas Alumni Magazine*, vol. 57 (1958-1959), January 1959, no. 5, p. 19. Dr. E. Raymond Hall has been appointed Solon E. Summerfield Distinguished Professor, and Dr. Charles Duncan Michener has been appointed Elizabeth M. Watkins Distinguished Professor.

118. "The Case For a Large University." By George R. Waggoner, Dean of the College. *The University of Kansas Alumni Magazine*, vol. 57 (1958-1959), February 1959, pp. 4-5. Dean Waggoner makes a very strong case in favor of the large university.

119. "Widespread Concern for K. U.'s Needs in Critical Hour." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), December 1959, no. 4, pp. 12-13. "Never before have so many Kansans been so concerned over the issue of proper provision for the five state colleges."

120. "People--Not Numbers." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), October 1959, no. 2, pp. 4-7. This article makes detailed predictions about the enrollment of the University up to 1975. These predictions were reasonably accurate--just slightly conservative. The prediction was "nearly 17,000 students by 1970 and more than 20,000 by 1975". The enrollment was approximately 20,000 in 1971.

121. "Where Can We Put Them?" By James E. Gunn. *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), January 1960, no. 5, pp. 6-9. This is another article urging the need to make speedy preparation for the flood of students that will soon reach the campus. This article contains an important historical summary of the University's building program and a summary of its critical needs in 1960.

122. "Franklin Murphy Leaves Kansas; W. Clarke Wescoe To Be Chancellor." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), March 1960, no. 7, pp. 16-17. This is an announcement of Dr. Murphy's resignation and appointment as Chancellor of the University of California at Los Angeles. There are summaries of the accomplishments of Dr. Murphy and of Dr. Wescoe. There is a group photograph of Dr. Murphy and his entire family and a photograph of Dr. Wescoe.

123. "Chancellor's Last State of the University Message Describes The Murphy Years." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), June 1960, no. 9, pp. 10-12, 28-29. In this report Dr. Murphy describes his accomplishments as Chancellor of The University of Kansas.

124. "Dr. George Springer Directs Undergraduate Research Participation Project." *The University of Kansas Alumni Magazine*, vol. 58 (1959-1960), May 1960, no. 8, p. 15. Dr. Springer received a grant of $3,635 from the National Science Foundation for a project in the summer of 1960.

125. "Prophecy: The College Program To Be." By George R. Waggoner, '36, g'39, Dean, College of Liberal Arts and Sciences. *The University of Kansas Alumni Magazine*, vol. 60 (1961-1962), January 1962, no. 5, pp. 6-7, 27. Dean Waggoner undertakes to predict what the College and the University will be like in the 1970's, but the rebellions of the 1960's have intervened.

126. "A Bargain at the Price." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), December 1962, no. 4, pp. 4-5, 16. A discussion of the state of the University and its problems and needs.

127. "Editorial Comment: That Eurich Report." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), December 1962, no. 4, p. 10. "The State Board of Regents . . . commissioned a distinguished group of educators, headed by Dr. Alvin C. Eurich, to prepare a report on higher education in Kansas."

128. "New Director of University Libraries." *The University of Kansas Alumni Magazine*, vol. 51 (1952-1953), September 1952, no. 1, p. 32. This brief news item contains a picture of Robert Vosper and a brief account of his appointment to succeed Charles M. Baker, who had been Director of the University Libraries since 1928.

129. "Libraries Pass Half-Million Book Mark." By Robert Vosper, Director of Libraries. *The University of Kansas Alumni Magazine*, vol. 51 (1952-1953), December 1952, no. 4, pp. 8-9. This article is an account of progress of the library and plans for the future. There are photographs of Robert Vosper, Chancellor Murphy, Dr. E. Raymond Hall, and Professor Robert Taft.

130. "A California Librarian Turns Jayhawker." By Robert Vosper. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), October 1953, no. 2, p. 8. "Robert Vosper went East, and writes of Kansas libraries and some of the excellent collections he finds at K. U."

131. "The House That Books Built." *The University of Kansas Alumni Magazine*, vol. 59 (1960-1961), May 1961, no. 8, pp. 4-5. "The 1961 Kansas Legislature appropriates $1,800,000 for desperately-needed Watson Library additions. K. U. proposes to develop a major bibliographical center."

132. "Efficiency: The Watchword in an Expanded Watson Library." By R. Keith Lawton. *The University of Kansas Alumni Magazine*, vol. 59 (1960-1961), May 1961, no. 8, pp. 6-7.

133. "Almost a Decade--Not Quite a Million." By Robert Vosper, Director of Libraries. *The University of Kansas Alumni Magazine*, vol. 59 (1960-1961), May 1961, no. 8, pp. 8-9. The opening paragraph of this article reads as follows:

> Nine years ago when I came to the University of Kansas to direct its libraries, collections totalled 483,123 catalogued volumes and about 7,000 periodicals were received regularly. Today periodical subscriptions have jumped to 9,500 and on July 1 the catalog count will approach 920,000 volumes. (Robert Vosper has resigned to return to the University of California at Los Angeles, and Thomas R. Buckman has been appointed Director of Libraries.--Ed.)

134. "Books, Books, Books, . . . A Day in the Life of the K. U. Library Director--Robert Vosper." *The University of Kansas Alumni Magazine*, vol. 55 (1956-1957), May 1957, no. 8, pp. 4-7, 30. This article describes the tremendous growth of the university library and the efforts of Robert Vosper and Chancellor Murphy to make it still better. There are a number of good photographs, one of which shows Robert Vosper and Thomas Buckman, acquisitions librarian.

135. "Renaissance in Kansas." By Joseph Rubinstein, Curator of Rare Books. *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), May 1958, no. 8, pp. 8-9, 29-30. This is an article about the activities of Chancellor Murphy and Joseph Rubinstein in building up the book collections--especially the rare book collections--of the K. U. library.

136. "The Wescoe Years of Promise and Fulfillment." By James E. Gunn. *Kansas Alumni*, vol. 67 (1968-1969), June 1969, no. 8, pp. 2-5. This is Mr. Gunn's review of Dr. Wescoe's accomplishments as Chancellor of The University of Kansas from 1960 to 1969.

137. "Above Personal Preference, Comfort, Personal Security: 'Academic Freedom is Respect for Truth.'" *Kansas Alumni*, vol. 68 (1969-1970), October 1969, no. 2, pp. 2-6. This is the address given by Chancellor E. L. Chalmers, Jr., at his inauguration on September 15, 1969.

138. "Library Reminiscences." By Carrie M. Watson. *The Graduate Magazine*, vol. 6 (1907-1908), May 1908, no. 8, pp. 278-281.

139. "The Library in Two Tenses." By Carolyn McNutt. *The Graduate Magazine*, vol. 15 (1916-1917), April 1917, no. 7, pp. 201-207. This is the most comprehensive history of the library that had been written since Carrie M. Watson's history of the library in the *Quarter-Centennial History of The University of Kansas* published in 1891. In particular, this article describes the origins of the departmental libraries.

140. "Friendly, Generous Legislature Gives K. U. A Lift." *The Graduate Magazine*, vol. 47 (1948-1949), March 1949, no. 7, pp. 4-5. The sub-heading of the article reads: "Science Hall, Start on Field House, Completion of Journalism Home and Library as Well as Operating Funds Put University Ahead in Service to State".

141. "KU's Newest Landmark: The Kenneth Spencer Library." *Kansas Alumni*, vol. 67 (1968-1969), December-January 1968-1969, no. 4, pp. 10-12. This is an account of the Spencer Research Library and of its dedication on November 8, 1968. There is a photograph of C. P. Snow, Mrs. Spencer, and Chancellor Wescoe.

Griffin, Clifford S.

1. *The University of Kansas: A History*. Lawrence/Manhattan/Wichita, Kansas: University Press of Kansas, 1974. xiv + 808 pages.

Hackney, Edward T.

1. "An Inventory." *The Graduate Magazine*, vol. 12 (1913-1914), March 1914, no. 6, pp. 305-308.

Haworth, Erasmus

1. "Another Resignation." *The Graduate Magazine*, vol. 18 (1919-1920), March 1920, no. 6, pp. 162-163. This article describes the resignation of Erasmus Haworth and includes his letter of resignation, which is quite bitter. Chancellor Strong accepts his resignation with "a good deal of sadness".

2. "'Daddy' Haworth, Zealous Teacher, Scientist, Friend, Passes." By Charles F. Scott, '81, g'88. *The Graduate Magazine*, vol. 31 (1932-1933), December 1932, no. 3, pp. 8-9.

3. "He Knows the Kansas of the Ages." By E. Haworth. *The Graduate Magazine*, vol. 14 (1915-1916), March 1916, no. 6, pp. 166-169. This is an article written by Haworth about his work as state geologist (the editor supplied the title of the article).

4. "A Building for Mining Engineering and Geology." *The Graduate Magazine*, vol. 5 (1906-1907), January 1907, no. 4, pp. 124-127.

Hicks, John D.

1. *The Populist Revolt: A History of the Farmers' Alliance and the People's Party.* Minneapolis: University of Minnesota Press, 1931. xiv + 473 pages.

Hoad, W. C., e'98

1. "The Good Roads Movement in Eastern Kansas." *The Graduate Magazine*, vol. 4 (1905-1906), May 1906, no. 8, pp. 273-280. The first of a series of articles suggesting the practical relationship of the University and its alumni to the economic and social well being of the state.

Hodder, F. H.

1. "Prof. F. H. Hodder's Life Ends." *The Graduate Magazine*, vol. 34 (1935-1936), January 1936, no. 4, pp. 2-4. This is a series of articles on the life and work of Professor Hodder. One of the articles, written by Dean E. B. Stouffer, describes the first meeting of the faculty of the Graduate School.

2. "To the Editor of the Graduate Magazine." *The Graduate Magazine*, vol. 18 (1919-1920), May 1920, no. 8, pp. 221-224. This letter is a part of the controversy over university governance.

Hollands, Edmund H.

1. "To the Editor of the Graduate Magazine." *The Graduate Magazine*, vol. 18 (1919-1920), May 1920, no. 8, pp. 224-225. This letter is a part of the controversy over university governance.

Hopkins, Cora Pierson

1. "Letter to the Editor of the Graduate Magazine." *The Graduate Magazine*, vol. 4 (1905-1906), January 1906, no. 4, pp. 141-142.

Hyder, Clyde Kenneth

1. *Snow of Kansas: The Life of Francis Huntington Snow.* Lawrence, Kansas: University of Kansas Press, 1953. xiii + 296 pages.

2. "Francis Huntington Snow: The Spirit of K. U." By John H. Nelson, Dean of the Graduate School. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), October 1953, no. 2, p. 9. This is a review of Hyder's book [Hyder 1].

Kellogg, Vernon L.

1. "Vernon Kellogg." *The Graduate Magazine*, vol. 24 (1925-1926), March 1926, no. 6, pp. 25-26. This account of some of Vernon Kellog's recent activities is accompanied by a good photograph of him.

2. "Kellogg, Great Scientist, Could Have Succeeded in Other Fields." By William Allen White. *The Graduate Magazine*, vol. 36 (1937-1938), November 1937, no. 3, pp. 8-9. "Following the death August 8, 1937, of Dr. Vernon Kellogg, '89, g'92, his long time friend, William Allen White, published a splendid appraisal of his life in the *Emporia Gazette*." It is the article listed here.

Lefschetz, Solomon

1. "Reminiscences of a Mathematical Immigrant in the United States." *American Mathematical Monthly*, vol. 77 (1970), no. 4, April, pp. 344-350.

2. Biography. *American Men of Science*, all editions beginning with the Third Edition (1921), in which Professor Lefschetz received a "star".

3. Biography. *Who's Who in America*, all recent editions.

4. Biography and bibliography up to 1938. *A Semicentennial History of the American Mathematical Society, 1888-1938*. By Raymond Clare Archibald. New York: American Mathematical Society, 1938. 262 pages.

5. Biography. *World Who's Who in Science*. Chicago: Marquis-Who's Who, Inc. First Edition, 1968. 1855 pages.

6. *Selected Papers, Including the Book L'Analysis Situs*. New York: Chelsea Publishing Company, 1971. 639 pages. This book contains a full page photograph of the author and also (among other things):

   I. A Page of Mathematical Autobiography (pp. 13-38).

   II. On Certain Numerical Invariants of Algebraic Varieties, with Application to Abelian Varieties. (Awarded the Prix Bordin and the Bôcher Memorial Prize.) (pp. 41-196).

   V. L'Analysis Situs et la Géométrie Algébrique (pp. 285-439).

   Bibliography (to 1955) (pp. 629-634).

   Bibliography (1956-1970) (pp. 635-639).

7. "Solomon Lefschetz Awarded the Bordin Prize." *The Graduate Magazine*, vol. 18 (1919-1920), January 1920, no. 4, p. 109.

8. Biography. *Who's Who in America*, vol. 13 (1924-1925), Chicago: A. N. Marquis & Company. *Who Was Who in America*, vol. 5 (1969-1973), Chicago: Marquis-Who's Who. Professor Lefschetz died on October 27, 1972.

Lindley, E. H.

1. "As It Now Is; Biennial Statement of Conditions at the University Shows Growth of Upper Class Work." *The Graduate Magazine*, vol. 23 (1924-1925), December 1924, no. 3, pp. 3-6. This report documents the exceptionally low salary scale that prevails at The University of Kansas.

2. "E. H. Lindley, Chancellor Emeritus, Dies at Sea." *The Graduate Magazine*, vol. 39 (1940-1941), September 1940, no. 1, p. 14. This article, with photograph, has a short account of the death of E. H. Lindley.

3. "Their Eastern Tour a Shining Memory." *The Graduate Magazine*, vol. 39 (1940-1941), October 1940, no. 2, pp. 6-7. This article has an account of the E. H. Lindley trip to the Far East and of his death. It contains a part of a memorial address given by Rev. Theodore Aszman. The article contains much information.

Lippincott, J. A.

1. "A Few Words about Dr. J. A. Lippincott." By Charles G. Dunlap. *The Graduate Magazine*, vol. 5 (1906-1907), February 1907, no. 5, pp. 155-158.

Malott, Deane W.

1. The University Budget for 1951-1952. Minutes of the Meeting of the Senate, April 12, 1951. Strong Auditorium. The third paragraph of these minutes reads:

> The Chancellor then reported briefly on the University budget. He stated that there will be $8,200,000 worth of construction on the campus this summer, including $1,863,000 for the new field house and $631,000 for various special construction projects, and that next year's operating budget will be $5,208,000 as compared with this year's $4,882,500. He called attention to the research budget of $300,000, and pointed out that this fund will not be used for keeping people on the staff when they would otherwise be dropped.

2. "Inaugural of Deane W. Malott, Ninth Chancellor, University of Kansas." *The Graduate Magazine*, vol. 38 (1939-1940), October 1939, no. 2, pp. 5-6.

Marvin, Frank Olin

1. "In Retrospect: Engineering Work in the University." *The Graduate Magazine*, vol. 8 (1909-1910), March 1910, no. 6, pp. 197-204.

2. Biography. *American Men of Science*, First Edition, 1906.

3. "Frank Olin Marvin." *The Graduate Magazine*, vol. 13 (1914-1915), February 1915, no. 5, pp. 140-143. This is an account of the life and work of Frank Olin Marvin, written by Professor H. E. Riggs of the University of Michigan, Ann Arbor.

4. "A Brief Survey of the Growth of the University and Its Present Needs." *The Graduate Magazine*, vol. 5 (1906-1907), January 1907, no. 4, pp. 115-124.

McCarthy, Paul J.

1. *Algebraic Extensions of Fields*. Waltham, Massachusetts: Blaisdell Publishing Company, 1966. ix + 166 pages.

2. (with Max D. Larsen) *Multiplicative Theory of Ideals, Pure and Applied Mathematics*, volume 43. New York and London: Academic Press, 1971. xiv + 298 pages.

McMurry, Orrin K.

1. "A Californian on College Democracy." By Orrin K. McMurry. *The Graduate Magazine*, vol. 18 (1919-1920), March 1920, no. 6, pp. 155-161. This article indicates that there is national agitation among the universities over faculty control and college and university democracy. Mr. McMurry is an alumnus of the University of California; his article was reprinted from the *California Alumni Fortnightly*. Mr. McMurry quotes from the annual report for 1912 of President Schurman of Cornell University, who had much to say on university governance.

Miller, Ephraim

1. "Some Memories." *The Graduate Magazine*, vol. 3 (1904-1905), January 1905, no. 4, pp. 123-131. This article contains some reminiscences of early life in the University, including stories about Chancellor Fraser and the teaching of mathematics.

2. Biography. *American Men of Science*, First Edition, 1906.

3. Scrapbook entitled "Ephraim Miller" in the Regional History Room, Spencer Memorial Library, The University of Kansas. This scrapbook contains many photographs of Professor and Mrs. Miller and many clippings of articles from newspapers and magazines.

4. "Ephraim Miller at 89." *The Graduate Magazine*, vol. 19 (1920-1921), May 1921, no. 8, p. 45. There are brief greetings to Chancellor Lindley, and a photograph of Professor and Mrs. Miller and an account of his recent 89th (it was his 88th!) birthday on April 25, 1921.

5. "Professor and Mrs. Ephraim Miller." *The Graduate Magazine*, vol. 23 (1924-1925), April 1925, no. 7, p. 3. This article refers to the forthcoming celebration of Professor Miller's birthday on April 25, 1925 at a reunion to be held on Professor Miller's 92nd birthday. "They visited K. U. three years ago at Commencement time." The article is accompanied by a nice full-length photograph of Professor and Mrs. Miller.

6. "Ephraim Miller's Recollections." This paper was read by Professor Ephraim Miller at the banquet given by the K.U. Alumni Association at the Biltmore Hotel in Los Angeles, California in honor of Professor Miller's ninety-second birthday anniversary in April, 1925. This paper was published in the *Lawrence Daily Journal-World* in three installments on May 25, 26, and 27, 1925.

7. "Adored Teacher was E. Miller." *The Graduate Magazine*, vol. 29 (1930-1931), January 1931, no. 4, pp. 8-11, 24.

8. "The Tablet to be Presented by the Class of 1881." *The Graduate Magazine*, vol. 29 (1930-1931), May 1931, no. 8, pp. 2-3. There is, on page 2, a photograph of the bronze tablet to Professor Miller that will be presented to the University at the commencement in June. On page 3 we find a short news item about the plans for the dedication of the tablet. A picture of the class of 1881 appears on page 9.

9. "Golden Anniversary Class Presents Miller Tablet." *The Graduate Magazine*, vol. 29 (1930-1931), June 1931, no. 9, p. 5. This article describes the dedication of the bronze tablet honoring Ephraim Miller on the west wall of the central rotunda of Strong Hall.

10. "Adored Teacher Was E. Miller." *The Graduate Magazine*, vol. 29 (1930-1931), January 1931, no. 4, pp. 8-11, 24. Under the general title are grouped six articles on the life and work of Ephraim Miller:

    "A Prince Has Fallen," by George O. Foster, '01, Registrar.

    "How Fortunate to Have Known Him," by Carrie M. Watson, '77, Librarian Emerita.

    "His Was Vital Scientific Spirit," by U. G. Mitchell, '06, Professor of Mathematics.

    "He Understood Students' Problems," by Ethel M. Giles, '02, Abilene.

    "Professor Miller in California," by Adele Humphrey, '95, Los Angeles, California.

    "He Inspired Confidence," by Hannah Oliver, '74, Professor of Latin.

11. "Death of Professor Ephraim Miller." *The Graduate Magazine*, vol. 29 (1930-1931), December 1930, no. 3, p. 22. Professor Miller died on November 20, 1930.

12. "Biography, and Bibliography of Scientific Publications of Ephraim Miller." *Kansas University Quarterly*, series A, vol. 8, no. 4, October 1899, p. 152. This bibliography lists eight publications by Miller. One is a book on trigonometry, and five are papers on astronomy.

13. "Bibliography of Scientific Publications of Ephraim Miller. First Supplement." *Kansas University Quarterly*, series A, vol. 10, no. 4, October 1901, p. 154. This bibliography lists two additional papers on astronomy that have been published by Professor Miller.

14. "The Corona of the Sun." By Ephraim Miller. *Transactions of the Kansas Academy of Science*, vol. xvii (1899-1900), pp. 210-214. This article was published also in *Popular Astronomy*, vol. 8, pp. 80-86, 1900.

15. (A tribute to Ephraim Miller) *Douglas County Republican*, December 4, 1930.

16. "Ephraim Miller attends Commencement in June, 1921." *The Graduate Magazine*, vol. 19 (1920-1921), June 1921, no. 9, p. 4.

17. "Formerly in the University Faculty." Notes prepared by Prof. E. Miller, 558 Lake Ave., Pasadena, California, for thirty-six years a member of the University faculty. *The Graduate Magazine*, vol. 12 (1913-1914), March 1914, no. 6, pp. 308-311; vol. 12 (1913-1914), April 1914, no. 7, pp. 337-340; vol. 12 (1913-1914), May 1914, no. 8, pp. 371-375.

18. Resolution Upon the Death of Professor Ephraim Miller. Adopted by the University Senate at a meeting held on January 6, 1931. Minutes of the University Senate.

19. Biography. *Who's Who in America*, vol. 6 (1910-1911), Chicago: A. N. Marquis & Company, 1910. *Who Was Who in America*, vol. 1 (1897-1942), Chicago: A. N. Marquis Company. Ephraim Miller died on November 20, 1930.

Mitchell, Ulysses Grant

1. "Student Self Government at the University of Kansas." *The Graduate Magazine*, vol. 18 (1919-1920), February 1920, no. 5, pp. 123-129.

2. "To Europe for Study." *The Graduate Magazine*, vol. 30 (1931-1932), February 1932, no. 5, p. 32. This article describes the plans of Professor and Mrs. U. G. Mitchell to spend the spring semester of 1932 at Columbia University in New York City and the summer in Europe. He planned to attend the International Mathematical Congress in Zurich, Switzerland in September just before returning to Lawrence.

3. "U. G. Mitchell, Genial Professor." *The Graduate Magazine*, vol. 33 (1934-1935), December 1934, no. 3, p. 8. This article contains a very complete account of Professor Mitchell's life.

4. "U. G. Mitchell." *The Graduate Magazine*, vol. 22 (1923-1924), October 1923, no. 1, pp. 5, 30. This is a brief account, for alumni, of Professor Mitchell's current activities in the University.

5. "They Stand Out." *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, p. 4. This page has photographs and accounts of the services of three of the University's alumni. The first one is U. G. Mitchell, and there is a rather detailed account of his services to the University.

6. "Necrology: Professor U. G. Mitchell." *The Graduate Magazine*, vol. 40 (1941-1942), January 1942, no. 5, pp. 21-22. This is an account of Professor Mitchell's death on January 1, 1942. It includes much information about his life and his activities in the University.

7. Resolution in Memory of Professor Ulysses Grant Mitchell. Adopted by the University Senate at a meeting held on March 3, 1942. Minutes of the University Senate.

8. "Dr. U. G. Mitchell Resigns as Head." *Lawrence Daily Journal-World*, January 7, 1941. The opening paragraph of this article reads:

> The resignation of Dr. U. G. Mitchell, as head of the University of Kansas mathematics department, and the appointment of Dr. Ellis B. Stouffer to succeed him, were announced today by Chancellor Deane W. Malott, as having been approved by the board of regents.

This article also contains a rather complete summary of Dean Stouffer's career.

9. "Honor Professor and Mrs. U. G. Mitchell." *Lawrence Outlook*, January 23, 1941. This item announces the retirement dinner for Professor and Mrs. Mitchell that was to be held on January 31, 1941.

10. Announcement of the retirement dinner for Professor and Mrs. U. G. Mitchell. *Lawrence Daily Journal-World*, January 21, 1941.

11. "Honor Professor and Mrs. Mitchell." *Lawrence Outlook*, February 6, 1941. This account of the retirement dinner given for Professor and Mrs. Mitchell on January 31, 1941 contains the following important paragraph:

> In honor of his service as head of the mathematics department gift of a $100 scholarship in the department is being established for the years '41 and '42.

12. "U. G. Mitchell Dies Suddenly at Home." *Lawrence Daily Journal-World*, January 1, 1942.

13. "U. G. Mitchell is Dead." *Kansas City Star*, January 1, 1942.

14. "U. G. Mitchell Rites." *Lawrence Daily Journal-World*, January 3, 1942.

15. "K. U. Professor Dies." *Topeka Capital*, January 3, 1942.

16. "Sudden Death of Prof. U. G. Mitchell." *Lawrence Outlook*, January 8, 1942.

17. "Celebration of the University's 75th Anniversary (Professor U. G. Mitchell, Chairman of the 75th Anniversary Committee)." *The Graduate Magazine*, vol. 39 (1940-1941), September 1940, no. 1, p. 15.

Nelson, C. Ferdinand

1. "Problems of Democracy in University Administration." By C. Ferdinand Nelson. *The Graduate Magazine*, vol. 18 (1919-1920), January 1920, no. 4, pp. 89-93. This is a strong statement demanding faculty participation in University management and government.

Newson, Henry Byron

1. Biography. *American Men of Science*, First Edition, 1906.

2. Biography of Dr. Mary Winston Newson (Mrs. Henry Byron Newson). *American Men of Science*, First Edition, 1906.

3. "Pamphlet by Professor Newson." *The Graduate Magazine*, vol. 5 (1906-1907), November 1906, no. 2, pp. 78-79. This is a short review of a pamphlet entitled "Graphic Algebra" which Professor Newson has written for use in secondary schools.

4. "Professor Newson is the author of an article in a recent number of the Giornale di Matematiche." *The Graduate Magazine*, vol. 6 (1907-1908), November 1907, no. 2, pp. 79-80.

5. A news item gives an account of the death of Professor Newson. The article states that he "died unexpectedly at his home in Lawrence, Friday night, February 18". Other accounts state that he died on Thursday night, February 17. *The Graduate Magazine*, vol. 8 (1909-1910), February 1910, no. 5, p. 183.

6. "Henry Byron Newson." *The Graduate Magazine*, vol. 8 (1909-1910), April 1910, no. 7, pp. 237-241. This article contains an address given by Professor Charles G. Dunlap at the exercises in memory of Professor Newson, held in the University Hall, Tuesday, March 22, 1910. Professor Dunlap and Professor Newson were classmates at the Ohio Wesleyan University and later at Johns Hopkins University.

7. "Professor Newson as Teacher and Scientist." *The Graduate Magazine*, vol. 8 (1909-1910), April 1910, no. 7, pp. 241-243. An address by Dean Frank O. Marvin at the exercises in memory of Professor Newson, at the University, March 22. Dean Marvin spoke as the representative of the scientific departments of the University.

8. "Biography and Bibliography of Scientific Publications of Henry Byron Newson." *Kansas University Quarterly*, series A, vol. 8, no. 4, October 1899, p. 154. This bibliography lists seventeen papers that have been published by Professor Newson.

9. "Bibliography of Scientific Publications of Henry Byron Newson. First Supplement." *Kansas University Quarterly*, series A, vol. 10, no. 4, October 1901, p. 155. This bibliography lists ten additional papers for Professor Newson, making a total of twenty-seven papers published by him.

10. "Projective Transformations in One Dimension and Their Continuous Groups." H. B. Newson. *Kansas University Science Bulletin*, vol. 1 (1902), pp. 115-142.

11. "Theory of Collineations." H. B. Newson. *Kansas University Science Bulletin*, vol. 6 (1911-1912), pp. x + 319. With one plate which shows a photograph of the author.

12. Biography. *Who's Who in America*, vol. 4 (1906-1907), vol. 5 (1908-1909), Chicago: A. N. Marquis & Company, 1906. *Who Was Who in America*, vol. I (1897-1942), Chicago: A. N. Marquis Company. H. B. Newson died on February 17, 1910.

Newson, Mary Frances Winston

1. Biography. *American Men of Science*, Editions 1-10 in years 1906-1961.

2. *Bulletin of the American Mathematical Society*, 2nd series, vol. 3 (1896-1897), p. 199.

3. *Bulletin of the American Mathematical Society*, vol. 43 (1937), p. 747.

4. *Hilbert*. By Constance Reid. New York, Heidelberg, Berlin: Springer-Verlag, 1970. xi + 290 pages.

This biography of David Hilbert describes the University of Göttingen during the period in which Mary Frances Winston (later Mrs. Newson) was a student there. She was fortunate to receive from Felix Klein a cordial invitation to study at Göttingen, because women were accorded only a limited reception at German universities. Furthermore, Felix Klein was austere and unapproachable, and he maintained a certain distance with students and faculty alike [p. 49]. At a later period David Hilbert himself was unable to obtain the habilitation of Emmy Noether at Göttingen [p. 143], and she was not appointed Privatdozent until 1919 [p. 165]. Nevertheless, Göttingen was the first university in Germany to grant a doctoral degree to a woman [p. 143], and two women--Grace Chisholm from Cambridge University and Mary Frances Winston from the University of Chicago--were admitted for graduate study in mathematics in 1894. In a letter to her former classmates at Cambridge, Grace Chisholm (later Mrs. W. H. Young) described Göttingen as follows [p. 48]: "There are about a dozen . . . in our lectures. We are a motley crew: five are Americans, one is a Swiss-French, one is a Hungarian, and one an Italian. This leaves a very small residuum of German blood." David Hilbert joined the faculty of the University of Göttingen in March 1895 [p. 47], and he quickly became a favorite with the students [p. 51]: "After the Wednesday morning seminars he walked with the students up to a popular restaurant on the Hainberg for lunch and more mathematics. On these excursions he talked freely to them 'as equals', according to Blumenthal . . . ." Through attendance at Hilbert's lectures and seminars and through participation in informal excursions, Miss Winston presumably became well acquainted with him. Hilbert's lecture entitled "Mathematical Problems", delivered before the International Congress of Mathematicians at Paris in 1900 [pp. 69-85], has become one of the most famous lectures on mathematics ever given; some of the twenty-three problems described in it have received the attention of the world's best mathematicians up to the present day. Such an important lecture demanded translation into English and publication in the United States; Miss Mary Frances Winston, who had received her Ph.D. at Göttingen in 1896, was approved by Hilbert to make the translation. Chapter X [pp. 74-83] of Hilbert's biography contains the general remarks in his lecture; the footnote on the first page reads as follows.

The general remarks from the talk on "Mathematical Problems," delivered by David Hilbert before the Second International Congress of Mathematicians at Paris in 1900, are reprinted with permission of the publisher, the American Mathematical Society, from the *Bulletin of the American Mathematical Society*, vol. 8, 1902, pp. 437-445, 478-479. Copyright 1902. The entire text of the talk appears in the *Bulletin* translated into English by Dr. Mary Winston Newson with the approval of Prof. Hilbert.

5. "Mathematical Problems." Lecture Delivered Before The International Congress of Mathematicians at Paris in 1900. By Professor David Hilbert. *Bulletin of the American Mathematical Society*, vol. 8 (1901-1902), pp. 437-479. This article is described by the following footnote on its first page.

   Translated for the *Bulletin*, with the author's permission, by Dr. Mary Winston Newson. The original appeared in the *Göttinger Nachrichten*, 1900, pp. 253-297, and in the *Archiv der Mathematik und Physik*, 3d ser., vol. 1 (1901), pp. 44-63 and 213-237.

North College

1. "A Sad Semi-Centennial." *The Graduate Magazine*, vol. 15 (1916-1917), February 1917, no. 5, p. 142.

2. *The Graduate Magazine*, vol. 16 (1917-1918), March 1918, no. 6, pp. 163-179. This is a special number of *The Graduate Magazine* in commemoration of North College, which was being torn down at the time. Opposite page 163 there is an excellent full-page picture of North College.

O'Leary, R. D.

1. "Professor O'Leary Concludes Long Service to Students." *The Graduate Magazine*, vol. 34 (1935-1936), May 1936, no. 8, p. 8. R. D. O'Leary died on May 1, 1936. This is a brief account of his life and work in the University. There is a photograph of him.

2. "O'Leary's Graciousness Was Genuine." *The Graduate Magazine*, vol. 34 (1935-1936), June 1936, no. 9, pp. 18-19. This article, apparently written by Ben Hibbs '23, is a tribute to O'Leary. The article includes an excellent photograph of O'Leary.

3. "Once More: The Chancellor to Be." By R. D. O'Leary, '93. *The Graduate Magazine*, vol. 18 (1919-1920), May 1920, no. 8, pp. 217-221. This article is an answer to Dean Templin on the subject of faculty democracy and control. O'Leary's article is followed by letters to the editor from Professor F. H. Hodder and Edmund H. Hollands. They appear to support O'Leary's position.

Owens, Frederick W.

1. *The Graduate Magazine*, vol. 7 (1908-1909), November 1908, no. 2, p. 74. An announcement of the birth of a second daughter, Clara, to Frederick William Owens and Helen Brewster Owens.

2. *The Graduate Magazine*, vol. 12 (1913-1914), February 1914, no. 5, p. 294. An alumni news item about Fred W. Owens, e'02, g'02, and Helen Brewster Owens, '00, g'01. They have recently moved into their home overlooking Cayuga Lake, New York. The degree of doctor of philosophy was conferred on Mrs. Owens by Cornell University in 1910, and she still continues her interest in mathematics.

3. *The Graduate Magazine*, vol. 12 (1913-1914), March 1914, no. 6, p. 326. A note in the "Books and Articles" section reads as follows: "Helen Brewster Owens, '00, had recently in the *American Journal of Mathematics*, a paper on 'Cubic Congruences on a Family of Quadric Surfaces'". The Alumni Association still overlooks the fact that Mrs. Owens received a master's degree from The University of Kansas in 1901.

4. Biography of Frederick William Owens. *American Men of Science*, Sixth Edition (1938).

Patterson, David L.

1. "Growth of Democracy in University and College Administration." *The Graduate Magazine*, vol. 17 (1918-1919), April 1919, no. 7, pp. 195-201. This article refers to the constitution which was adopted by the Senate and approved by the Board of Administration in November 1915. Chancellor Strong appointed a new committee, now known as the Commission on the Reorganization of the University, and it met on April 14, 1919, to begin its work.

Peterson, Martha Elizabeth

1. Miss Peterson received a master's degree in mathematics from The University of Kansas in 1943. The title of her thesis was "Some Properties of a Special Four-Point".

2. "Martha Peterson Appointed Dean of Women." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), March 1952, no. 7, p. 32. There is a photograph of Miss Peterson, and the accompanying statement includes the news as follows: "To be Dean of Women July 1, Miss Martha Peterson, '37, g'43, has been Assistant Dean of Women since January, 1947".

3. "Martha Peterson '37, g'43, Ph.D. '59 Has Been Made Special Assistant to University of Wisconsin President Fred H. Harrington." *The University of Kansas Alumni Magazine*, vol. 61 (1962-1963), February 1963, no. 6, p. 40. This is a short news item, with a photograph of Martha Peterson, that describes her promotion (she had been Dean of Women at Wisconsin) and her new responsibilities.

4. "Martha E. Peterson, President of Barnard College, Elected Chairman of the American Council for 1971-1972." American Council on Education's *Higher Education and National Affairs*, vol. XX, no. 37, October 15, 1971. The announcement reads:

    > Martha E. Peterson, president of Barnard College, was elected on October 8 chairman of the American Council on Education for 1971-72. Miss Peterson had just concluded a three-year term on the Council's board of directors and served as chairman of the special search committee that nominated Roger W. Heyns to succeed Logan Wilson as president. She becomes the third woman and the second president of Barnard College to head the Council. The first was Virginia C. Gildersleeve who served as chairman in 1926-27 and was then president of Barnard. Elected in 1955-56 was Katharine E. McBride, then president of Bryn Mawr College.

Phi Beta Kappa

1. "Phi Beta Kappa, 40 Years Old at Kansas, Celebrates." By E. F. Engle. *The Graduate Magazine*, vol. 28 (1929-1930), April 1930, no. 7, p. 8.

2. "Development of Scholarship at the University of Kansas." By Ellis B. Stouffer, Dean, Graduate School. Delivered April 18, 1940, at the Joint Banquet of the Societies of Phi Beta Kappa and Sigma Xi, Celebrating the 50th Anniversary of the Founding of Chapters of Both on the Kansas Campus. *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, pp. 6-9.

3. Phi Beta Kappa. Alpha of Kansas. 1890-1903. University of Kansas. Spencer Research Library, The University of Kansas.

Porter, Richard W.

1. "Tribute to Porter." *The Graduate Magazine*, vol. 46 (1947-1948), December 1947, no. 4, p. 16. This is a tribute to Richard W. Porter, who graduated as an electrical engineer in 1934; he was a Summerfield Scholar. Porter was awarded an honorary Doctor of Science degree by Yale University on October 17, 1947. The Yale citation is given in full; it contains an account of his war-time services and other activities.

2. "A Challenge to Education." By Richard W. Porter. *The University of Kansas Alumni Magazine*, vol. 49 (1950-1951), June 1951, no. 9, pp. 17-18. This is a talk given by Dr. Porter at commencement. He urged the study of morality and social responsibility.

3. Photograph and a news article. *The University of Kansas Alumni Magazine*, vol. 51 (1952-1953), May 1953, no. 8, p. 26. Dr. Porter has been made general manager of the new General Electric guided-missile department.

4. "Man Soon Will Put New Moons in the Sky." By Richard W. Porter e'34, Consultant, Communications and Control, General Electric Company. *The University of Kansas Alumni Magazine*, vol. 54 (1955-1956), December 1955, no. 4, pp. 6-7. Dr. Porter was the speaker at Science and Mathematics Day in the fall of 1955. He predicted that the United States could send a man to the moon before 1980 if it decided to make the effort. There were other startling predictions.

5. "We Are Being Surpassed." By Richard W. Porter, e'34. Chairman, Technical Panel on Earth Satellites. *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), November 1957, no. 3, p. 10. In this article Dr. Porter comments on the seriousness of the Russian challenge as a result of their launching of Sputnik. (See also [*The Graduate Magazine* 113].)

Price, G. Baley

1. "A Program For The Association." *American Mathematical Monthly*, vol. 45 (1938), pp. 531-536. This paper is a condensed version of a paper read before the Kansas Section of the Association on April 2, 1938.

2. "Report of the Committee to Review the Activities of the Mathematical Association of America." *American Mathematical Monthly*, vol. 47 (1940), pp. 64-84. The committee consisted of D. R. Curtiss, T. C. Fry, F. L. Griffin, Martha Hildebrandt, C. V. Newsom, G. B. Price, Marie J. Weiss, and Rudolph E. Langer (chairman).

3. "Distributions Derived from the Multinomial Expansion." *American Mathematical Monthly*, vol. 53 (1946), pp. 59-74. This paper was suggested by bombing problems investigated while I was a member of the Operational Research Section at Headquarters, Eighth Air Force, 1943-1945 (see Appendix VIII); it was written during the summer of 1945 while I waited in Lawrence for a call to proceed to the Pacific theater of operations.

4. "Some Identities in the Theory of Determinants." *American Mathematical Monthly*, vol. 54 (1947), pp. 75-90. An expository paper written by G. B. Price.

5. "Bounds for Determinants with Dominant Principal Diagonal." *Proceedings of the American Mathematical Society*, vol. 2 (1951), pp. 497-502. This is a research paper written by G. B. Price.

6. "Derivatives and Jacobians." *Annali di Matematica Pura ed Applicata* (IV), vol. LVII (1962), pp. 311-320. This is a research paper written by G. B. Price.

7. Photographs of some members of the faculty, including G. B. Price, Professor of Mathematics and Chairman of the Department. *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), February 1952, no. 6, pp. 20-21, 28.

8. "Mathematics and K. U." By G. Baley Price, Chairman, Department of Mathematics. *The University of Kansas Alumni Magazine*, vol. 52 (1953-1954), November 1953, no. 3, pp. 6, 30. This article contains a photograph of Nachman Aronszajn and Gustave Choquet and also a group photograph of Guy W. Mith, Wealthy Babcock, G. B. Price, Florence Black, Mrs. S. Lefschetz, Professor S. Lefschetz, and E. B. Stouffer. This article lists five tasks which lie before mathematics; it describes the development of research in mathematics at K. U.; and it lists the needs of the Department.

9. *Linear Topological Spaces*. Princeton, N. J.: D. Van Nostrand Company, 1963. xv + 256 pages. The senior authors of this book were J. L. Kelley and Isaac Namioka; they were assisted by W. F. Donoghue, Jr., Kenneth R. Lucas, B. J. Pettis, Ebbe Thue Poulsen, G. Baley Price, Wendy Robertson, W. R. Scott, and Kennan T. Smith. A dittoed edition of this book was written in Lawrence in the summer of 1953.

10. "Faculty Profiles." *The University of Kansas Alumni Magazine*, vol. 53 (1954-1955), September 1954, no. 1, p. 20. There are photographs and one paragraph statements about G. Baley Price, Chairman, Department of Mathematics, and E. Raymond Hall, Allen Crafton, and Carlyle H. Smith.

11. *Universal Mathematics. Part 1. Functions and Limits*. By the 1954 Summer Writing Group of the Department of Mathematics, University of Kansas, consisting of F. A. I. Bowers, Jr., R. N. Bradt, C. E. Capel, W. L. Duren, Jr., G. B. Price, and W. R. Scott. Lawrence, Kansas: Student Union Book Store, 1954. Paper covers. vii + 340 pages. This book (with the subtitle *A Book of Experimental Text Materials*) was written in Lawrence in the summer of 1954 from an outline prepared by the Committee on the Undergraduate Program of the Mathematical Association of America. The Committee issued a reprint in hard covers in 1958.

12. *Elementary Mathematics of Sets, with Applications*. By R. N. Bradt, C. E. Capel, R. L. Davis, W. L. Duren, Jr., B. W. Jones, J. G. Kemeny, H. W. Kuhn, E. J. McShane, D. R. Morrison, G. B. Price, A. L. Putnam, and W. R. Scott. Buffalo, New York: Committee on the Undergraduate Program of the Mathematical Association of America, 1958. vii + 168 pages.

The first draft of this book had the title *Universal Mathematics. Part 2. Structures in Sets*; it was written by the 1954 Summer Writing Group of the Department of Mathematics, University of Kansas. The second draft was written at Tulane University in 1955, and the final version was edited by Robert L. Davis at the University of Virginia in 1958. This book has been translated into the Turkish language.

13. "The Chairman of K. U.'s Mathematics Department Describes--The Revolution in Mathematics." By G. Baley Price. *The University of Kansas Alumni Magazine*, vol. 56 (1957-1958), January 1958, no. 5, pp. 8-9, 29-30. This article contains three photographs made in room 103, Strong Hall while Professor Price taught a class there. One photograph shows Professor Price writing on the blackboard, and the other two show Ann Marsh, a student is the class. Cora Lee Price is partly visible behind Ann Marsh. Written shortly after the Russians launched Sputnik I in October 1957, this article describes the dramatic developments occurring in mathematics and summarizes the state of affairs in the Department of Mathematics at the time.

14. G. B. Price was a member of the 1958, 1959, and 1960 Summer Writing Groups that wrote the School Mathematics Study Group's sample textbook for the eleventh grade.

15. "Progress in Mathematics and Its Implications for the Schools." By G. Baley Price. Published as pp. 1-14 of *The Revolution in School Mathematics*. Washington, D. C.: The National Council of Teachers of Mathematics, 1961. iii + 90 pages. Translated into Spanish and published under the title *La Revolución en las Matemáticas Escolares* by the Organization of American States, 1963.

16. "Mathematics and Chemistry Studies." *The University of Kansas Alumni Magazine*, vol. 60 (1961-1962), January 1962, no. 5, p. 13. The mathematics part of this note reads as follows: "Dr. G. Baley Price, Chairman of the K. U. Mathematics Department, will conduct another National Science Foundation program on the campus this year to strengthen and enlarge graduate programs in mathematics. It is sponsored by the National Science Foundation. Twenty institution members will be selected from among advanced graduate students from institutions offering a Ph.D. in mathematics. Each will receive a stipend of $75 a week, and an allowance for dependents and travel and fees."

17. *Linear Equations and Matrices*. By J. B. Johnston, G. Baley Price, and F. S. Van Vleck. Reading, Massachusetts: Addison-Wesley Publishing Company, 1966. viii + 308 pages.

18. *Sets, Functions, and Probability*. By J. B. Johnston, G. Baley Price, and F. S. Van Vleck. Reading, Massachusetts: Addison-Wesley Publishing Company, 1968. viii + 376 pages. A preliminary edition of *Linear Equations and Matrices* and of *Sets, Functions, and Probability* was written in the summer of 1963 and published in a multilithed, paperback edition in two parts with the title *An Introduction to Mathematics*. *Sets, Functions, and Probability* has been translated into German and published in two paperback volumes: *Mengen, Funktionen und Wahrscheinlichkeit*, Band I: *Mengen und Funktionen*, Band II: *Wahrscheinlichkeit*. München und Wien: R. Oldenbourg Verlag, 1974.

19. "Mathematics and Education." By G. Baley Price. *The Encyclopedia of Education*, vol. 6 (1971), pp. 81-90. New York: The Macmillan Company and The Free Press, 1971.

20. "Award for Distinguished Service to Professor Griffith Baley Price." By W. L. Duren, Jr. *American Mathematical Monthly*, vol. 77 (1970), no. 2, February, pp. 115-117. Opposite page 115 there is a full-page photograph of Professor Price.

21. *To Improve Secondary School Science and Mathematics Teaching: A Short History of the First Dozen Years of the National Science Foundation's Summer Institutes Program, 1954-1965*. By Hillier Krieghbaum and Hugh Rawson. National Science Foundation. NSF 68-28. Washington, D. C.: U. S. Government Printing Office, 1969. 41 pages.

22. *An Investment in Knowledge: The First Dozen Years of the National Science Foundation's Summer Institutes Programs to Improve Secondary School Science and Mathematics Teaching, 1954-1965*. By Hillier Krieghbaum and Hugh Rawson. New York: New York University Press, 1969. vii + 334 pages.

23. "NSF Grants to the Association." *American Mathematical Monthly*, vol. 65 (1958), p. 547. This note announces a grant from the National Science Foundation to the MAA to support the Washington Conference.

24. "The Washington Conference." By H. M. Gehman, Secretary-Treasurer. *American Mathematical Monthly*, vol. 65 (1958), pp. 575-586. This report by Professor Gehman contains the proceedings of the Washington Conference.

25. *Introduction to Modern Algebra. Official Textbook for Continental Classroom*. By John L. Kelley. Princeton, N. J.: D. Van Nostrand Company, 1960. x + 338 pages. Paperbound. The acknowledgments on page vii contain a statement of the role G. Baley Price played in arranging Kelley's course on "Continental Classroom".

26. *Buildings and Facilities for the Mathematical Sciences*. An Educational Facilities Laboratories Report. By J. Sutherland Frame and John W. McLeod, F. A. I. A. Conference Board of the Mathematical Sciences, Washington, D. C., 1963. xii + 170 pages. Paperbound. The introduction to this report describes some of the contributions made to its preparation by G. Baley Price.

27. "A Brief Account of the Early History of the Conference Board of the Mathematical Sciences." By G. Baley Price. *Newsletter of the Conference Board of the Mathematical Sciences*, vol. 1 (1966), April, no. 1, pp. 1-3.

28. "Continental Classroom." *American Mathematical Monthly*, vol. 67 (1960), p. 690. This news article announces plans for the course in Contemporary Mathematics that was given on "Continental Classroom" during 1960-1961.

29. "Progress in Mathematics." By G. Baley Price. This article is identical with item 15, above. It is reprinted on pp. 201-216 of *The Subjects in the Curriculum: Selected Readings*. Edited by Frank L. Steeves. New York: The Odyssey Press, 1968. xii + 436 pages.

30. "Change in Argonne National Laboratory: A Case Study." By Ann Mozley. *Science*, vol. 174 (1971), no. 4004, 1 October 1971, pp. 30-38. This article is an account of Argonne National Laboratory and of the influence which Argonne Universities Association has exerted on it since 1965.

31. Biography. *Who's Who in America*, vol. 28 (1954-1955), and later volumes. Chicago: Marquis-Who's Who.

32. Information about the establishment of *Mathematical Reviews* and G. B. Price's connection with this enterprize can be found in: *Bulletin of the American Mathematical Society*, vol. 45 (1939), pp. 199, 203, 641-643, 804; vol. 46 (1940), pp. 195, 862; vol. 47 (1941), pp. 1-2, 182, 838; vol. 48 (1942), pp. 189-190, 803; vol. 49 (1943), p. 826; vol. 50 (1944), pp. 28-29; vol. 51 (1945), pp. 31, 354; vol. 52 (1946), p. 41.

33. Biography. *World Who's Who in Science*. Chicago: Marquis-Who's Who, Inc. First Edition, 1968. xvi + 1855 pages.

Rockefeller Panel Reports

1. *Prospect for America*. The Rockefeller Panel Reports. Garden City, N. Y.: Doubleday & Company, 1961. xxvi + 486 pages. Report V. "The Pursuit of Excellence: Education and the Future of America." (First published June 26, 1958). This report appears on pp. 335-392.

Schlegel, Frances

1. "Frances Schlegel Carruth." By J. H. Long. *The Graduate Magazine*, vol. 7 (1908-1909), October 1908, no. 1, pp. 12-14.

Sigma Xi

1. "K. U. Men Prominent in Sigma Xi National Scientific Society." By E. H. S. Bailey. *The Graduate Magazine*, vol. 23 (1924-1925), March 1925, no. 6, pp. 11-12.

2. "Development of Scholarship at the University of Kansas." By Ellis B. Stouffer, Dean, Graduate School. Delivered April 18, 1940, at the Joint Banquet of the Societies of Phi Beta Kappa and Sigma Xi, Celebrating the 50th Anniversary of the Founding of Chapters of Both on the Kansas Campus. *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, pp. 6-9. The article is accompanied by a photograph of the six founding members of the chapter of Sigma Xi: E. H. S. Bailey, F. O. Marvin, L. I. Blake, E. Miller, L. L. Dyche, and F. H. Snow.

3. *Sigma Xi. Kansas Iota. University of Kansas. The Fiftieth Anniversary of the Founding of The Kansas Chapter of The Society of The Sigma Xi. 1890-1940.* Compiled by W. H. Schoewe, Secretary. University of Kansas, April 1940. Revised January, 1941. Spencer Research Library, University of Kansas.

Slosson, Edwin Emory

1. "Dr. E. E. Slosson, Brilliant Interpreter of Science, Is Gone." Also, "Edwin Emory Slosson." By R. D. O'Leary. *The Graduate Magazine*, vol. 28 (1929-1930), November 1929, no. 2, pp. 6-7.

Smith, Guy W.

1. "Sport Talk." By Bill Mayer. *Lawrence Daily Journal-World*, June 17, 1968. This article is a short biography of Professor Smith which emphasizes his interest in football. The article contains a photograph of Professor Smith which was probably made in June 1968.

2. "Dr. Guy Smith Dies at Age 82." *Lawrence Daily Journal-World*, September 10, 1968. Professor Smith died on Monday, September 9, 1968.

3. "Dr. Guy Smith." An editorial. *Lawrence Daily Journal-World*, September 11, 1968. This editorial is a tribute to Professor Smith.

Snow, Francis Huntington

1. "Extracts from Letters to a Friend in Massachusetts." By Ex-Chancellor F. H. Snow. *The Graduate Magazine*, vol. 3 (1904-1905), December 1904, no. 3, pp. 81-103.

2. "Address by Ex-Chancellor Francis H. Snow." *The Graduate Magazine*, vol. 1 (1902-1903), November 1902, no. 2, pp. 45-49. This address was given at the inauguration of Chancellor Strong; Snow summarizes the accomplishments of his administration.

3. "Addresses and Papers Given at the Memorial Services for Frances Huntington Snow Held on November 10, 1908." *The Graduate Magazine*, vol. 7 (1908-1909), January 1909, no. 4, pp. 121-144.

4. "Francis Huntington Snow, Scientist." By Ephraim Miller. *Transactions of the Kansas Academy of Science*, vol. xxii, pp. 19-34, 1908. Snow was a member of the small group of persons who established the Kansas Academy of Science in 1868. This article on the life and work of Snow contains his complete bibliography; it is followed by several other articles which describe Snow as a person, a teacher, and a scientist.

Spangler, William Cornelius

1. "Memorial Addresses Delivered In University Hall, December 5, 1902." By F. D. Hutchins, '83; Olin Templin, '86; J. W. Green, Dean of the Law School; Edward C. Little, '83. *The Graduate Magazine*, vol. 1 (1902-1903), March 1903, no. 6, pp. 215-234.

Spring, Leverett Wilson

1. *Kansas: The Prelude to the War for the Union*. (American Commonwealths: Kansas) Cambridge, Mass.: Houghton Mifflin Company, 1885. viii + 340 pages.

Sterling, Miles Wilson

1. *Quarter-Centennial History of The University of Kansas, 1866-1891.* With portraits of Chancellors. Edited by Miles Wilson Sterling. Topeka, Kansas: Geo. W. Crane & Co., 1891. 198 pages.
2. "Sterling's Record Has Been More Than 'Just Hanging On.'" *The Graduate Magazine*, vol. 31 (1932-1933), November 1932, no. 2, pp. 10-11.
3. "Upbuilder of University Was M. W. Sterling." *The Graduate Magazine*, vol. 42 (1943-1944), December 1943, no. 4, p. 14. Professor Sterling died on December 17, 1943.

Stouffer, Ellis B.

1. "Development of Scholarship at the University of Kansas." By Ellis B. Stouffer, Dean, Graduate School. Delivered April 18, 1940, at the Joint Banquet of the Societies of Phi Beta Kappa and Sigma Xi, Celebrating the 50th Anniversary of the Founding of Chapters of Both on the Kansas Campus. *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, pp. 6-9.
2. "New Teachers." *The Graduate Magazine*, vol. 13 (1914-1915), October 1914, no. 1, p. 21. This column lists the following two members of the staff of the Department of Mathematics:

    Edward H. Carus, instructor in mathematics. B.S., University of Wisconsin. Student at universities of Cambridge, Göttingen, Giessen, and Paris, 1912-14.

    E. B. Stouffer, assistant professor of mathematics. A.B., A.M., 1907, Drake University; Ph.D. 1911, University of Illinois; instructor, Drake University, 1907-1908; instructor, University of Illinois, 1911-14.

3. "Dean E. B. Stouffer." *The Graduate Magazine*, vol. 22 (1923-1924), October 1923, no. 1, p. 14. Dean Stouffer had been appointed Dean of the Graduate School in 1922. This article contains a photograph of Dean Stouffer, and it announces his appointment as assistant to the chancellor and chairman of the Budget Committee:

> The important work of Dean Kelly in assisting Chancellor Lindley in research and administrative problems will be continued by Ellis B. Stouffer, dean of the Graduate School, and previously for several years a professor of mathematics. All details relative to the budget of the University will be in the hands of Dean Stouffer.
>
> "Dean Stouffer has shown special aptitude in dealing with administrative problems", Chancellor Lindley said in announcing the appointment. "He has already the confidence of the Board of Administration, the faculty, and the student body."

4. "Will Study in Italy, Dean Stouffer." *The Graduate Magazine*, vol. 24 (1925-1926), March 1926, no. 6, p. 23. There is a photograph of Dean E. B. Stouffer and a short news note which states that he has been granted a year's leave of absence for study in Italy during the next academic year. Dean Stouffer held a Guggenheim Fellowship during 1926-1927.

5. "A Portrait of Dean E. B. Stouffer." *The University of Kansas Alumni Magazine*, vol. 50 (1951-1952), February 1952, no. 6, p. 36. This page contains a photograph of Dean E. B. Stouffer, Mrs. Stouffer, and Miss Jean Stouffer standing beside the oil portrait of Dean Stouffer. The photograph was made at a tea honoring Dean and Mrs. Stouffer in the Museum of Art on Sunday, February 25, 1951. The oil portrait was shown publicly at that tea for the first time. The statement below the photograph reads:

> A portrait of E. B. Stouffer, professor of mathematics and former dean of the University, was presented to the University by faculty members and other friends. The portrait was presented at a tea for the Stouffers held last year in the Museum of Art, Spooner Hall. Shown beside the portrait are Jean Stouffer, '41, b'46, Dean Stouffer, and Mrs. Stouffer. The portrait, painted by Bernice Ackermann Lopes, fs'21, hangs in the Graduate School office.

6. "Three Are Retiring." *Lawrence Daily Journal-World*, June 30, 1950. On June 30, 1950, Dean Stouffer retired from his position as Dean of the University.

7. "Dean Stouffer Retires as Dean of the University." *The Graduate Magazine*, vol. 48 (1949-1950), June 1950, no. 9, p. 10.

8. "Dr. U. G. Mitchell Resigns as Head. Dr. E. B. Stouffer Succeeds Him as Chairman of K. U. Math Department." *Lawrence Daily Journal-World*, January 7, 1941.

9. "After 215 Years Total Service These Teachers Retire From Faculty." *The University of Kansas Alumni Magazine*, vol. 53 (1954-1955), March 1955, no. 7, pp. 8-9. There are photographs of Robert McNair Davis, John Ise, Jacob O. Jones, Ralph H. Major, Ellis B. Stouffer, and Donald M. Swarthout.

10. "Faculty Advisory Committee." *The University of Kansas Alumni Magazine*, vol. 49 (1950-1951), March 1951, no. 7, p. 14. There are printed on this page photographs of nine faculty members who served as an advisory committee to help the regents select a new chancellor. Dean E. B. Stouffer was chairman of the committee.

11. "Married Student Housing Name Honors Dean Ellis B. Stouffer." *The University of Kansas Alumni Magazine*, vol. 55 (1956-1957), October 1956, no. 2, p. 10. This short news article contains a photograph of Dean Stouffer at his desk. It states that Chancellor Murphy announced at the opening convocation that the married students' apartment project had been named Stouffer Place in honor of forty-one years of service to the University in many areas by Dr. Ellis B. Stouffer. There is a summary of Dean Stouffer's career.

12. Biography. *Who's Who in America*, vol. 14 (1926-1927), and later volumes. Chicago: A. N. Marquis Company. Dean Stouffer died on November 24, 1965.

## Strong, Frank

1. "Administrations of the University." By Frank Strong. *The Graduate Magazine*, vol. 20 (1921-1922), October 1921, no. 1, pp. 7-9, 28-30.

2. "The University of Kansas Is Admitted to the Association of American Universities." *The Graduate Magazine*, vol. 7 (1908-1909), January 1909, no. 4, p. 150.

3. "Needs of the University for the Coming Biennium." By Chancellor Frank Strong. *The Graduate Magazine*, vol. 3 (1904-1905), November 1904, no. 2, pp. 41-52.

4. "To the Graduates and Friends of the University of Kansas: A letter from Chancellor Frank Strong." *The Graduate Magazine*, vol. 3 (1904-1905), January 1905, no. 4, pp. 137-144.

5. "The University and the Legislature." Editorial. *The Graduate Magazine*, vol. 3 (1904-1905), March 1905, no. 6, pp. 217-221.

6. "The Needs of the University for the Next Biennium." By Frank Strong, Chancellor. *The Graduate Magazine*, vol. 5 (1906-1907), December 1906, no. 3, pp. 83-98.

7. "The Needs of the University." By Chancellor Frank Strong. *The Graduate Magazine*, vol. 7 (1908-1909), December 1908, no. 3, pp. 81-109.

8. "For the Next Biennium: To the Alumni of the University of Kansas." By Chancellor Frank Strong. *The Graduate Magazine*, vol. 9 (1910-1911), December 1910, no. 3, pp. 81-101.

9. "The University." *The Graduate Magazine*, vol. 10 (1911-1912), April 1912, no. 7, pp. 241-244. Full-page photograph of Chancellor Strong. This is a statement addressed "To Graduates and Former Students of the University of Kansas" about the state of the University. The occasion is Strong's completion of ten years as the chancellor of the University. It is an important statement on the state of the University, the problems which confront the University, and Strong's conception of the functions and purposes of the University. The three things for which a university should stand are, first, teaching; second, research and investigation; and third, public service.

10. "What Will You Do About It?" *The Graduate Magazine*, vol. 13 (1914-1915), March 1915, no. 6, pp. 171-173.

11. "What We Have: To the Graduates and Former Students of the University." *The Graduate Magazine*, vol. 15 (1916-1917), January 1917, no. 4, pp. 107-110.

12. "This is What the Chancellor Says--And the Chancellor Knows." *The Graduate Magazine*, vol. 17 (1918-1919), December 1918, no. 3, pp. 67-68.

13. "A Letter from Doctor Strong: To Graduates and Former Students of the University of Kansas." *The Graduate Magazine*, vol. 18 (1919-1920), October 1919, no. 1, pp. 5-16. In this letter Chancellor Strong announces his retirement at the end of the year 1919-1920. Also, he summarizes the accomplishments of his administration. He changed a small college into a big university.

Taft, Robert

1. *Across the Years on Mount Oread, 1866-1941*. Lawrence, Kansas: The University of Kansas, 1941. vi + 202 pages.

2. *The Years on Mount Oread: A Revision and Extension of Across the Years on Mount Oread*. Lawrence, Kansas: University of Kansas Press, 1955. x + 228 pages.

3. "Professor Taft, Chemist; Robert Taft, Historical Writer." *The Graduate Magazine*, vol. 49 (1950-1951), October 1950, no. 2, pp. 7-8. This article contains an excellent photograph of Robert Taft, and it gives a short account of his life and work. It describes especially his historical writing. "An A.B. in history was his first college degree awarded in 1916 in Grand Island, Nebraska, where his football career was begun and ended."

Templin, Olin

1. "Lest We Forget." *The Graduate Magazine*, vol. 32 (1933-1934), February 1934, no. 5, pp. 4-7.

2. "Plan Chime Tower on Campus to Memorialize Pioneers." *The Graduate Magazine*, vol. 32 (1933-1934), February 1934, no. 5, p. 4.

3. "Honor Templin With Fellowship." By Ruth Garver Gagliardo. *The Graduate Magazine*, vol. 40 (1941-1942), December 1941, no. 4, pp. 2-3.

4. "A Grateful State Will Show Just Recognition." *The Graduate Magazine*, vol. 34 (1935-1936), February 1936, no. 5, pp. 2-3. Dean Templin is proceeding with his plans to build a permanent memorial to the pioneers of Kansas.

5. "The Report of the Dean of the College." *The Graduate Magazine*, vol. 15 (1916-1917), October 1916, no. 1, pp. 5-10. "Chancellor Frank Strong: In conformity to the constitution of the University, I submit herewith my report as Dean of the College of Liberal Arts and Sciences."

6. "The Duty of the State to the Scholar." *Kansas University Quarterly*, series B, vol. 6 (1897), pp. 97-114.

7. A letter "To the Alumni", from Olin Templin, Chairman of the Executive Committee of the Alumni Association. *The Graduate Magazine*, vol. 1 (1902-1903), October 1902, no. 1, p. 32. This letter announces the establishment of *The Graduate Magazine* and describes the plans that have been made for its editing and publication. Dean Templin was the driving force behind this enterprize.

8. "The New Building." *The Graduate Magazine*, vol. 8 (1909-1910), February 1910, no. 5, pp. 181-182. The "new building" is the present Strong Hall, and this article describes the plans that are being made for its construction. The preliminary plans for the building were drawn up by Dean Olin Templin and Professor Griffith. There is a large fold-out at the beginning of this number of *The Graduate Magazine* which is a photograph of the architect's drawing of the proposed building. The original plans called for a much more imposing building than the one actually built. The article states that mathematics will be located in the east wing.

9. "University Endowment Association." *The Graduate Magazine*, vol. 3 (1904-1905), November 1904, no. 2, pp. 67-68. This article describes the establishment of the Endowment Association on October 31, 1891, and a reorganization "at a recent meeting" at which Dean Olin Templin and others were elected to the Board of Directors.

10. "Proper Care for Gifts to K. U.; Endowment Association Is Reorganized with Full Membership in Board of Trustees--Ready for Trusteeship for Private Bequests in Accord with Wishes of Donors." *The Graduate Magazine*, vol. 19 (1920-1921), November 1920, no. 2, pp. 12-13. In the reorganization of the Endowment Association, Chancellor Lindley was named president and Olin Templin became secretary. This reorganization was an opening move in a campaign to raise one million dollars to build the stadium and the Kansas Union as World War I memorials.

11. "The Chancellor to Be." By Olin Templin, '86. *The Graduate Magazine*, vol. 18 (1919-1920), April 1920, no. 7, pp. 187-191. This article is a part of the controversy over faculty control and university democracy. The June number of *The Graduate Magazine* contains letters from J. M. Challiss, 1'94, Arthur L. Corbin, 1894, and Richard R. Price, '97, which support the position taken by Dean Templin.

12. "The Alumni Association and the Graduate Magazine." By Olin Templin, Chairman of the Executive Committee. *The Graduate Magazine*, vol. 3 (1904-1905), February 1905, no. 5, pp. 173-179.

13. "Change in Directorate." *The Graduate Magazine*, vol. 12 (1913-1914), March 1914, no. 6, p. 326. Dean Templin has resigned from the Board of Directors of the Alumni Association after eight years of service. This article summarizes his work in establishing *The Graduate Magazine*, in reorganizing the Alumni Association, and in establishing the printing plant for printing *The Graduate Magazine*.

14. "Dean Templin Returns." *The Graduate Magazine*, vol. 16 (1917-1918), May 1918, no. 8, pp. 238-239. This news item describes Dean Templin's war service, most of which was spent as an assistant to Herbert Hoover in the Federal Food Administration in Washington.

15. Resolution in Memory of Olin Templin, Professor Emeritus of Philosophy. Adopted by the University Senate at a meeting held on April 13, 1943. Minutes of the University Senate.

16. "Templin, Monumental Figure, Passes Away." *The Graduate Magazine*, vol. 41 (1942-1943), January 1943, no. 5, p. 17.

17. "Youth in Spirit, Man in Wisdom." By E. H. Hollands, Professor of Philosophy. *The Graduate Magazine*, vol. 41 (1942-1943), March-April 1943, nos. 6-7, pp. 4-5. Page 4 contains a complete summary of the career of Olin Templin. He died on March 4, 1943, and a memorial service for him was held in the Fraser Hall Chapel on March 14, 1943.

*University Daily Kansan*

1. "Math Teacher to Give Talks." *University Daily Kansan*, vol. 51 (1953-1954), October 15, 1953. This article gives an account of the plans for the forthcoming visit of Professor and Mrs. Lefschetz on October 18-22, 1953.

2. "Moon Rocket Trip in 25 Years Seen." *University Daily Kansan*, vol. 53 (1955-1956), October 31, p. 1.

3. "800 Visitors See Science Day." *University Daily Kansan*, vol. 53 (1955-1956), October 31, p. 1.

4. "Senate Vote Retains ROTC." *University Daily Kansan*, vol. 80 (1969-1970), no. 35, October 31, 1969, p. 1. This article contains an account of the Senate vote taken on Thursday, October 30, 1969, on the report prepared by the Senate committee of which Professor G. Baley Price was chairman. The article reports that the Senate committee studied the ROTC problem for nine months. The article is accompanied by a photograph of Chairman Price made in the blackness of the Senate meeting in Swarthout Recital Hall.

5. "Union Burns." *University Daily Kansan*, vol. 80 (1969-1970), no. 118, April 21, 1970, p. 1. This article is an account of the fire that burned the roof off of the Union Ballroom on the evening of Monday, April 20, 1970.

6. "Heller Asks Watch." *University Daily Kansan*, vol. 80 (1969-1970), no. 119, April 22, 1970, p. 1. This article describes the fire-watch that Dean Heller established in University buildings, using faculty members.

7. "US Troops Enter Cambodia." *University Daily Kansan*, vol. 80 (1969-1970), no. 126, May 1, 1970, p. 1. The opening paragraph of this article is the following:

   > President Nixon announced Thursday night that several thousand American ground combat troops had entered Cambodia to wipe out Communist headquarters for all military operations against South Vietnam.

8. "Four Students Killed in Anti-War Clash." *University Daily Kansan*, vol. 80 (1969-1970), no. 128, May 5, 1970, p. 1. This article describes the shooting of four students at Kent State University.

9. "Disruption of the Chancellor's ROTC Review in Memorial Stadium." *University Daily Kansan*, vol. 79 (1968-1969), no. 129, May 12, 1969. On page 1 there is an article with the headline "Radicals Disrupt KU Military Review". On pages 8-9 there is the following two-page headline: "'Peace' Demonstration Brings Much Comment". The first article, with the headline "Demonstrators Disrupt Review", opens as follows: "SDS and war memorial demonstrators defied the administration and succeeded in cancelling the ROTC review Friday". The next article is entitled "Governor's Reaction". The next article, entitled "Wescoe's Stand", is a signed statement made by Chancellor Wescoe in response to comments and criticisms of faculty members and citizens about recent events and acts of violence in the University. The opening paragraph of the last article, entitled "SenEx Will Act", is the following: "The University Senate Executive Committee (SenEx) yesterday issued a statement which said it plans to take action against those who participated in Friday's demonstration action against the Chancellor's ROTC Review in Memorial Stadium".

Wheeler, John Jefferson

1. "New Staff Members in Mathematics." *The Graduate Magazine*, vol. 10 (1911-1912), October 1911, no. 1, pp. 26-28. J. O. Hassler, Herbert E. Jordan, Hazel MacGregor, and J. J. Wheeler have been appointed to positions in the Department of Mathematics.

2. "Professor John J. Wheeler Has Been Appointed University Marshal." *The Graduate Magazine*, vol. 15 (1916-1917), October 1916, no. 1. p. 22.

3. "Professor Wheeler, Marshal." *The Graduate Magazine*, vol. 26 (1927-1928), June 1928, no. 9, p. 5. This page contains a short news item about Professor Wheeler's activities as University marshal at the recent commencement.

4. "Six K. U. Faculty Members Retire." *Lawrence Daily Journal-World*, July 2, 1947. This article announces the retirement of Professor Wheeler:

   > John J. Wheeler, associate professor of mathematics, came to K. U. as an instructor in 1911 and attained his present rank in 1928. He did his undergraduate work at the University of Indiana and taught at Friends University, Wichita, for six years prior to coming here. From 1916 until recently he held the title of university marshal.

5. "Six Math Teachers Equal 181 Years." *The Kansan*, July 15, 1947. The total service of Herbert E. Jordan, John J. Wheeler, Ellis B. Stouffer, Florence Black, Guy W. Smith, and Wealthy Babcock amounts to 181 years.

6. "Faculty Members Retire From Teaching Staff." *The Kansan*, July 3, 1947. Professor John J. Wheeler is one of those whose retirement is announced.

7. "Commencement Marshals, Professors Ray Q. Brewster and J. J. Wheeler." Photograph. *The Graduate Magazine*, vol. 38 (1939-1940), June 1940, no. 10, p. 24.

Wilcox, A. M.

1. "A. M. Wilcox, Forty-Three Years a Professor, Dies." Also, "An Appreciation." By M. W. Sterling. *The Graduate Magazine*, vol. 27 (1928-1929), January 1929, no. 4, pp. 11-12. Professor Wilcox died on January 3, 1929.

Wilder, Bessie E.

1. *University of Kansas Graduate School Theses, 1888-1947*. Compiled by Bessie E. Wilder, Documents Librarian. University of Kansas Publications. Library Series No. 2. Lawrence, Kansas, 1949.

   Part I: Authors and Theses (Alphabetically Listed Under Former), pp. 5-147.

   Part II: Department Index, pp. 148-177.

   Part III: Chronological Index, pp. 178-208.

   Part IV: Subject Index, pp. 209-305.

Williston, S. W.

1. "Doctor Samuel Wendel Williston." *The Graduate Magazine*, vol. 17 (1918-1919), November 1918, no. 2, pp. 35-37. This article by Professor E. H. S. Bailey is an account of the life and work of Williston--one of the truly great men on the faculty of The University of Kansas.

2. *Fossils and Flies: The Life of a Compleat Scientist, Samuel Wendell Williston (1851-1918)*. By Elizabeth Noble Shor. Norman, Oklahoma: University of Oklahoma Press, 1971. xiv + 285 pages.

Wooton, William

1. *SMSG: The Making of a Curriculum*. New Haven and London: Yale University Press, 1965. ix + 182 pages.

Young, John Wesley

1. (With Oswald Veblen) *Projective Geometry*, Volume I. Boston: Ginn and Company, 1910. x + 345 pages.

2. (With Oswald Veblen) *Projective Geometry*, Volume II. Boston: Ginn and Company, 1918. xii + 511 pages. Veblen explains in the preface that he was responsible for almost all of the work on this volume.

3. *Fundamental Concepts of Algebra and Geometry*. Prepared for Publication with the cooperation of William Wells Denton, assistant in mathematics in the University of Illinois. With a Note on "The Growth of Algebraic Symbolism" by Ulysses Grant Mitchell, Assistant Professor of Mathematics in The University of Kansas. New York: The Macmillan Company, 1911. vii + 247 pages.

4. "New Staff Members in Mathematics." *The Graduate Magazine*, vol. 9 (1910-1911), October 1910, no. 1, pp. 23-24. John Wesley Young has been appointed Professor of Mathematics and Head of the Department; U. G. Mitchell and A. D. Pitcher have been appointed Assistant Professors of Mathematics.

# History of the Department of Mathematics

# of the University of Kansas

# 1866-1970

## Supplement

G. Baley Price

# Chapter 1

## The Pioneer Period

## 1866-1890

1. Description of Chancellor John Fraser by S. A. Riggs [Fraser 1, pp. 117-123].

John Fraser was born in Cromarty, Scotland, March 22, 1827. He was a student in the University of Edinburgh for a time, and afterwards in the University of Aberdeen, where he graduated in 1844. He taught for a short period in the Bermudas, and from there went to the presidency of the Agricultural College of Pennsylvania. He came to Jefferson College, at Canonsburg, Pennsylvania, where I was a student, as the professor of mathematics and astronomy, in 1855.

In stature he was below the medium; but his sturdy, closely knit frame was impelled by a spirit extraordinarily active, earnest, and courageous. He had a remarkably rich, musical voice, black hair, which he wore quite long, a full, dark beard, very expressive black eyes, and, as I viewed him, an exceedingly attractive personality.

Mentally he was alert and strong, with the characteristics resulting from the thorough training and discipline of the Scotch universities, and he gave himself to the work of teaching with a zeal and enthusiasm that knew no fatigue. He loved the work of the teacher, an essential to the highest success in that line of effort. He never drifted.

As an instructor, he had a grasp of the principles of the higher mathematics, and their practical application, that seemed absolute, and his class-room explanation of them was so clear and simple as to be fascinating. Differential and integral calculus and mechanics--studies I had under him--are not of a character to afford much pleasure to the average student; yet Professor Fraser's perfect mastery of them, and his manner of instruction and elucidation, clothed them with an interest to the dullest of his pupils.

In his social life and character, Professor Fraser was a marked favorite. All of the other professors in the college were men past middle life, and several of them were quite advanced in years; and in their intercourse with the students were formal and reserved. Professor Fraser, younger than many of his pupils and unmarried, naturally found his companionship very largely among the students; and although he was, in his intercourse with them, as much the friend and comrade, as the teacher and master, he never sacrificed or compromised the dignity of his office or lost the power of control which pertained to his position in the faculty. He was at all times, and in every relation, a courteous and cultured gentleman.

He had a fine appreciation of young manhood, and manifested an intense desire to encourage its highest development in his students; and in the class-room, speaking to the class as a body, he always addressed them as "young gentlemen." His uniform friendly courtesy found a ready and appreciative response from the students.

He had a generous tolerance and sympathy for the student who made an honest effort in his class work, but who, from a lack of natural ability or aptitude, or from insufficient preparation for advanced work, was lagging and discouraged; and it was his habit to spend his evenings with such pupils, assisting and encouraging them in their school work. While I have no doubt that the professors in the University of Kansas are in the habit of rendering such aid and comfort to the struggling weak among their students, I am free to say that, in my college days, the conduct of Professor Fraser in this regard was entirely exceptional, and made a deep impression on me. His popularity with the students, their attachment for and confidence in him, is indicated by the fact that he took with him into the One Hundred and Fortieth Pennsylvania Volunteers, a regiment he recruited for the Union army in 1862, and which he commanded as colonel during the War of the Rebellion, a full company from Jefferson College, the entire student body at that time numbering not more than two hundred and fifty. He was a gallant soldier, participating with his regiment in the battles of Chancellorsville, and Gettysburg, and many other battles, and near the close of the war, was promoted to the rank of brigadier general, for gallant conduct in battle. He was taken prisoner by the Confederates and was kept for a time in the Andersonville, and Columbia prisons. Shortly after the close of the Civil War, I met Captain Thomas Thorpe, a brother of Simeon M. Thorpe--the attorney and State senator from Douglas county who was killed at the time of the raid on Lawrence by Quantrell--who stated to me that he had been a fellow prisoner with Colonel Fraser in a Southern prison pen. Commenting on the imperturbable coolness and conspicuous bravery of Colonel Fraser, he said that, on one occasion, the prisoners were exposed to the fire of a Confederate battery, and, naturally, they all sought such cover as they could find, but that the Colonel sat composedly in the open upon some timbers, where he had a plain view of the Rebel guns, and with pencil and paper, amused himself by estimating the curvature and distance of the course of the shells as they came towards him.

Professor Fraser's subordinate position at Jefferson College gave him no opportunity for the exercise of his capacity for initiation or organization, such as came to him in Kansas. When he entered the duties of chancellor of the Univeristy of Kansas, he found enrolled about one hundred and twenty students, only six of them in college classes, and a building equipment consisting of the North College at the north end of Mount Oread. Realizing the impossibility of successfully conducting the work of the school in such narrow quarters, he urged upon the Board of Regents, at their meeting on the first of December, 1869, the necessity for new and more commodious buildings. The State was not in financial condition to provide a proper building, even if it had been sufficiently impressed with the necessity for doing so, and the executive committee was instructed by the Board of Regents to confer with the authorities of the city of Lawrence with reference to procuring an issue of the bonds of the city to be used in the erection of buildings. Chancellor Fraser took the initiative in this matter with the zeal and enthusiasm which characterized all his work. Advising with me as to what kind of a proposition he should submit to the authorities and people of Lawrence, he stated his view of the needs of the institution, and suggested that he would ask that the city issue its bonds in the sum of one hundred thousand dollars, the proceeds thereof to be used in the erection of a building that would meet the present and near future needs of the school. He asked me what I thought of the proposition. It struck me as preposterous to ask for so large an amount, and I tried to dissuade him from doing so, believing that he would meet with failure and discouragement. He insisted that no smaller amount would provide a building that would permit the natural and proper growth of the school; and expressed his belief that if he could present the matter to the business men of the city in a public meeting he could convince them that it would be a wise policy to lend the State the credit of the city to that extent. He secured a large attendance of the business men and leading citizens at a meeting held in the district court room, and there presented to them his views of the future of the University and its pressing needs, with a power and enthusiasm that crushed all opposition, and secured the endorsement of his proposition by an almost unanimous vote.

Following this meeting, action was taken to procure the necessary legal authority for the city to make such a bond issue. The bonds were voted by the electors of the city at a special election called for that purpose; were issued by the city and turned over to the Board of Regents; and with the avails Fraser Hall was secured, and in part constructed. I think I do not do injustice to any other person when I say that Chancellor Fraser is entitled to a greater degree of credit than any and all others for his remarkable achievement, which, however burdensome it may have been to the city of Lawrence, advanced the interests and standing of the University at least ten years.

General Fraser entered upon his duties as chancellor, June 17, 1868, and tendered his resignation to the Board of Regents April 15, 1874. The six years covered by his administration were full of trials and discouragements. The new building, now Fraser Hall, was not in condition for occupancy until December, 1872, and then, although sheltering the school, was so unfinished in the interior as to be hardly habitable in the winter season. The funds arising from the sale of the city bonds were not sufficient to finish and furnish rooms enough to accommodate the school, and the residue required was given by the legislature grudgingly and in several appropriations. The State was financially poor, and the members of the legislature seemed to have no proper conception of the character of the school or of its needs; treating it in the discussions, and characterizing it as a Lawrence school, and giving to it accordingly. Fraser Hall was not finished and adequately furnished for the uses of the school until the fall of 1873, shortly before the resignation of Chancellor Fraser.

In rendering credit to the several administrations of the University, the conditions surrounding each should be considered. Chancellor Fraser found the school a preparatory school, located in a building inadequate for the work it was then doing. He left it housed in a beautiful and commodious building, said to have been the largest school building in the country at that time, with college classes fully organized and doing work appropriate to a university course. This changed condition was brought about during a period when Kansas was in its most depressed financial condition, and before the people of the State at large were aroused to the importance of the school, or the obligation resting on the State to give it an adequate support. His successors have enjoyed the benefits of his work, a constantly growing interest in the University on the part of the people of the State, and a greater liberality on the part of the legislature in providing for it.

Professor Wilson Sterling in his *History of the University*, writing of the administration of Chancellor Fraser, says: "His work of six years as head of the University had shown that he possessed executive ability in no mean degree; but he lacked the power of controlling men and harmonizing discordant elements." Scant praise this, in view of the great work of Chancellor Fraser under most trying conditions. General Fraser was not a politician. He abhorred the methods of politicians, and was powerless to protect himself against them. Worn by the burdens and anxieties of his office, and irritated by the known efforts that were being made by a member of the faculty to destroy his influence and supplant him in the chancellorship, he may have carried into his administration of University affairs too much of the rigidity of military rule, and too little of the tact necessary in dealing with an inharmonious faculty; but the conditions that led to his resignation were not wholly of his making, and his friends, and the friends of the University throughout the State, who had followed closely the development of the University, believe that a great injustice was done him in the manner of his removal.

After he resigned the office of chancellor of the University, General Fraser removed to Topeka. At the next Republican State convention he was nominated State superintendent of public instruction. His administration of that office was a most notable one, and merited recognition by a renomination. But he knew not the ways of the politician, and could not bow to the bosses, and his place was given to a locality--a thing too common in Kansas political conventions--and a man obscure before and unheard of since was nominated.

George W. Martin, secretary of the State Historical Society, a man perhaps more thoroughly acquainted with Kansas political affairs than any other, in a personal letter of recent date says: "There have been several political outrages in Kansas, the most cruel among them, I think, being the refusal to give John Fraser a second term as State superintendent of public instruction."

General Fraser's ability as an educator was so widely known that he was at once called to a chair in the Western Pennsylvania University at Pittsburg. After a short period of service in that institution he died on the fourth of June, 1878.

2. Department of Mathematics Courses of Instruction, from the 1874-1875 University Catalog.

Collegiate Department

Of the several departments contemplated in the act of incorporation, only one has yet been organized, viz: the *Department of Science, Literature and the Arts*. This Department, at present, comprises *six* courses of Instruction, viz:--a Classical, and a Modern Literature Course, each leading to the degree of Bachelor of Arts; a General Scientific Course, and three Special Scientific Courses,--one in Chemistry, one in Natural History, and one in Civil and Topographical Engineering,--each of the *four* Scientific Courses leading to the degree of Bachelor of Science. Other courses of instruction will be added as the growth of the state and of the University may render advisable.

*Terms of Admission.* For terms of admission to the Collegiate Department see Preparatory Course. Equivalents are accepted.

The mathematics requirements in the six courses are the following. The student could choose his course, but the curriculum for each course was rigidly prescribed.

*Classical Course*

Freshman Class

- First session: Algebra--Series, Logarithms and General Theory of Equations
- Second session: Geometry--Elements completed

Sophomore Class

- First session: Trigonometry
- Second session: Analytical Geometry; Conic Sections

Junior Class

- First session: Logic
- Second session: Astronomy

Senior Class

- First session: Astronomy
- Second session: none

*General Scientific Course*

Freshman Class

- First session: Algebra--Series, Logarithms and General Theory of Equations
- Second session: Geometry--Elements completed

Sophomore Class

- First session: Trigonometry
- Second session: Analytical Geometry--Conic Sections

Junior Class

| | |
|---|---|
| First session: | Differentials of Functions, and Geometric Applications |
| Second session: | Integration of simple Functions, and Linear Equations<br>Astronomy |

Senior Class

| | |
|---|---|
| First session: | Astronomy |
| Second session: | none |

*Modern Literature Course*

The mathematics requirements in this course seem to be identical with those in the Classical Course. No calculus is required, but two semesters of Astronomy are required.

*Course in Civil Engineering*

The Freshman courses are identical with those in the Freshman year of the Scientific Course.

The Sophomore courses are identical with those in the Sophomore year of the Scientific Course, with the addition of Industrial Drawing.

Junior Class

| | |
|---|---|
| First session: | Calculus--Differentials of Functions, and Geometric Applications<br>Descriptive Geometry |
| Second session: | Calculus--Integration of Simple Functions, and Linear Equations<br>Applied Mechanics--Forces in rigid bodies; Hydrostatics; Strength of Materials<br>Astronomy |

Senior Class

| | |
|---|---|
| First session: | Astronomy<br>Analytical Mechanics |
| Second session: | Analytical Mechanics |

*Course in Natural History*

The courses in the Freshman and Sophomore Classes are identical with those in the same classes for the General Scientific Course. Astronomy is required in the second session of the Junior Class, but there is no other mathematics in the Junior and Senior Classes for this Course.

*Course in Chemistry*

Freshman and Sophomore years are identical with those in the General Scientific Course. Astronomy is required in the second session of the Junior year, but there is no other mathematics in the Junior and Senior years for this Course.

## Preparatory Department

This Department has been organized to supply the existing want of suitable Preparatory Schools in the State, and therefore will not be made a permanent feature of the University.

*Classical Course*

Junior Class

First session: Arithmetic

Second session: Arithmetic

Middle Class

First session: Elementary Algebra

Second session: Elementary Algebra, through Simple Equations

Senior Class

First session: Elementary Algebra--Radicals and Equations of second degree

Second session: Geometry--First five Books

*Scientific Course*

Junior Class

"Studies--Same as those of the Junior Class, Classical Course, with the addition of Drawing."

Middle Class

First session: Elementary Algebra

Second session: Elementary Algebra, through Simple Equations

Senior Class

First session: Algebra--Radicals and Equations of second degree

Second session: Geometry--The first Five Books

*Modern Literature Course*

Junior Class

"Studies--Same as those of the Junior Class, Classical Course."

Middle Class

First session: Elementary Algebra

Second session: Elementary Algebra, through Simple Equations

Senior Class

First session: Elementary Algebra, Radical Equations of second degree

Second session: Geometry--First Five Books

3. "A Few Words About Dr. J. A. Lippincott", by Charles F. Dunlap, from *The Graduate Magazine*, vol. 5, February 1907, no. 5, pp. 155-158 [Lippincott 1].

Death has dealt gently with the officers and faculty of the University of Kansas, but as our beloved University grows older and begins to become venerable, as the traditions become more distinctly marked, as students come and go, as one generation replaces another, sweeping and positive changes must inevitably occur. Old faces must go; new ones must take their places. It has been but a few years since the venerable and revered Dr. Marvin, an ex-chancellor of the University died, and it has been but a brief eleven years since Professor Robinson, a man who had been connected with the University from the beginning, passed away.

Six years ago, the University was sorely smitten when Vice Chancellor Spangler died, and now we are called upon to mourn the passing of Ex-Chancellor Lippincott, fourth chancellor of the University, who died after a brief illness, on December 30, 1906, at the residence of his son, J. B. Lippincott, at Los Angeles, California.

Joshua Allen Lippincott was born January 31, 1835, in Burlington county, New Jersey. When a lad he attended the country school, and later entered Pennington Seminary, where he prepared for Dickinson College. He was twenty-three years old when he graduated. He was offered a position in Pennington Seminary at once, and began to teach in the departments of mathematics and German. After teaching for four years, he resigned his position at Pennington Seminary to become superintendent of public schools at Scranton, Pennsylvania. He was successful in his new field, so that in a short time he was called to a position in the New Jersey State Normal School at Trenton, New Jersey. In 1865 he was admitted as a member of the Wyoming Conference of the Methodist Episcopal Church. He became pastor of Asbury church, Hackensack, New Jersey, a position which he held for two years. He then became professor of mathematics and astronomy at Dickinson College. Here he remained until 1883, when he resigned his chair to accept the chancellorship of the University of Kansas. He resigned the chancellorship in 1889, and became pastor of the First Methodist Episcopal Church at Topeka, a position which he held most acceptably to the great advancement of the church. Later, he was pastor of the Arch Street Methodist Episcopal Church at Philadelphia. Until a year ago, he was secretary of the Methodist Episcopal Hospital at Philadelphia. This was his latest activity.

Dr. Lippincott received the degree of D. D. from Lafayette College in 1882, and in 1886 the University of Michigan conferred the degree of LL. D. upon him.

Dr. Lippincott leaves two sons, J. B. Lippincott, a graduate of the University, at present principal assistant engineer of the Owens Valley work in connection with the Los Angeles city water works system, and Dr. Walter Lippincott, who is practising medicine in Seattle, Washington.

One is struck with the diversified interests that made up the life of Dr. Lippincott. It shows that he was a man unusually gifted with executive power and ability. His life was an exceedingly varied and busy one. He was a worker to the last, and he never spared himself, by imposing his burdens upon others. He had to find an outlet for his energies. Activity made up his life. No detail, however trivial, was ever slighted. He loved work, and found satisfaction and solace in it.

Dr. Lippincott came to the University when it was small, and was still encumbered with a Preparatory department. There were but three buildings in which to house the various departments, including the scientific laboratories. The library was small, and occupied Room 14 in Fraser Hall. There were only eighteen members of the faculty. The chancellor, in addition to his administrative duties, served as professor of moral philosophy. At this time the appropriations for the maintenance of the University were not large, and growth under the circumstances seemed almost impossible.

One of the greatest triumphs of the administration was the emancipation of the University from the Preparatory department. This movement was initiated by Dr. Marvin, but it was carried almost to completion by Dr. Lippincott. It may be regarded as the most significant accomplishment of his administration. It was during his service that great impetus and stimulus were given to the high schools of the State by giving them full opportunity to prepare students for the University. Dr. Marvin had begun this movement, but it was completed by Dr. Lippincott. With the disappearance of the Preparatory department from the University, the high schools saw their chance. They responded to the call and enlarged and developed their courses, where necessary, so as to meet the requirements for entrance to the University. The wisdom of this movement has been tested and approved by many years of experience.

Although hampered in his endeavors to build up the University and to expand and enlarge its departments, and burdened with the many details incident to administration, Dr. Lippincott still framed large ideals of education, and formulated broad plans for the development of the University, and held courageously to his task of building up the institution. During the period of his service, the faculty was increased from nineteen members to more than thirty, and the appropriations were increased from thirty thousand dollars to seventy-five thousand. Snow Hall was also built. These are some of the external facts that render Dr. Lippincott's administration noteworthy. Although he never accomplished all that he had planned, he never modified his ideals or lowered his standards. He was faithful to the large trust that had been imposed upon him, and his whole life and energy were devoted to the cause of the University. He gave himself up with a singleness of purpose to his great and absorbing work.

Dr. Lippincott was a man of much decisiveness of character. He was firm in his convictions, and unswerving in his devotion to the cause of higher education. He had a supreme belief in the cause which he professed, and in the future of the University.

He was an excellent speaker, easy and fluent, always clear and pointed, often eloquent. He was impressive because of his great earnestness. As a preacher he was effective, and his sermons were well reasoned, coherent discourses. He preached as one having a message, with great seriousness, and with much impressiveness of manner.

Dr. Lippincott has left his impress upon the University. He has become a part of our history and of our traditions. His influence was for the high, the noble, the ideal. Hundreds of students who knew him, and who came under his teachings and his influence, will arise and call him blessed. He has left behind him a fragrant memory which will always be cherished by those whose privilege it was to know this good man, who has so recently passed from us.

It is a sad reflection that the old familiar faces must pass from our sight, but it is the inevitable law of nature.

"The old order changeth, yielding place to new."

# Chapter 2

## An Era of Greatness

## 1890-1910

1. "Development of Scholarship at the University of Kansas", by Ellis B. Stouffer, Dean of the Graduate School, from *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, pp. 6-9 [Stouffer 1].

The seeds of scholarship were planted at the University of Kansas before the first faculty meeting had been held or the first student enrolled. Francis Huntington Snow, a member of the first faculty of the University and a quarter of a century later its chancellor, tells in a letter to a friend in Massachusetts of his efforts to report for duty to Chancellor Oliver, ten days before classes were scheduled to start. I quote from his letter:

"Upon arrival in Lawrence on the first, after taking my first Kansas meal at the Sherman House, I met my former townsman, Mr. Samuel Kimball, who at once took me to the Episcopal rectory, where he introduced me to the Rev. R. W. Oliver, the Chancellor of the University, who I thought would inform me of the necessary steps to be taken before the opening of the University on the twelfth instant. I found him in his study in company with the Presbyterian minister, the Rev. W. A. Starrett, a member of the Board of Regents. They were smoking long-stemmed pipes and the air was saturated with tobacco smoke. The Chancellor informed me that he didn't think of anything that needed to be done before opening day, and advised me to get a gun at Jaedicke's and a horse at O'Connor's stable and go hunting prairie chicken and quail."

Apparently the advice was followed and right there began an amazing interest in the unexplored natural history of this region which transplanted itself into the lives of those early day students and brightened an otherwise dreary period of two decades. The story requires that we trace Snow's work in some detail, after we have taken a glance at that first faculty, the curriculum and the student body.

Chancellor Oliver was president and financial officer of the Board of Regents and had nothing to do with instruction. He gave with slight remuneration what time could be spared from his work as Rector of the Protestant Episcopal church of Lawrence.

The first faculty, consisting of three men, was elected on July 19, 1866. The record does not show how extensive was the canvass for candidates or what were the sources of the recommendations of the men chosen. One important requirement seems to have been that no two members of the faculty should belong to the same religious denomination. E. J. Rice was elected professor of belles lettres and mental and moral science, D. H. Robinson professor of languages, and F. H. Snow professor of mathematics and natural science. That no specific preparation was considered necessary for a particular professorship is indicated by the fact that Snow, trained in Greek and theology, was nominated for at least two of the professorships, and possibly for all three. The training of these men was represented by the bachelor's degree of that time. The first degree of doctor of philosophy in this country had been granted by Yale only six years earlier. The master's degree had no significance whatever, as evidenced by a quotation from the Harvard catalog of 1866-67:

"The Degree of Master of Arts is conferred in course on every Bachelor of Arts of three years standing, on the payment of the usual fee, who shall, in the interval, have sustained a good moral character."

Please note that the payment of the fee is placed before good moral character!

Rice was elected president of the faculty. Under his leadership a curriculum was planned in a few days and classes were started on the twelfth of September, 1866, in the newly erected building on North College Hill. The college curriculum published in the first few catalogs is almost a duplication of that of Harvard of the same dates, and probably of that of every other New England college. The students were to be examined for admission in Latin, Greek, mathematics, English grammar, geography, United States history and physiology. During the freshman year they studied Latin, Greek, mathematics, history; during the sophomore year the same subjects plus rhetoric; during the junior year Latin, Greek, physics, chemistry, astronomy, logic and history of literature; and during the senior year geology, mental and moral philosophy, zoology, political economy, constitution and religion. In this first curriculum there were no electives except that Greek in the junior year might be replaced by botany.

Fifty-five students entered the preparatory department that first year but it was not until the second year that two students entered upon the college course. In 1873, seven years after the opening of the institution, the first bachelor's degrees were granted.

## Adapted to Conditions

These early facts have been cited here neither because they appear amusing nor because humble beginnings might give a feeling of pride in our progress, but rather for the reason that they are highly significant to our discussion. This institution, like others, was compelled to adapt itself to its time and its place. It was essentially a preparatory school for the first decade, and for the first two decades the number of preparatory students exceeded the number of college students. In 1866 there was no public school in Kansas capable of preparing students for the freshman class.

The faculty were teaching in the college classes all that they themselves had been taught. The bachelor's degree of that day advanced the student little, if any, beyond the sophomore year of today. Imagine, if you please, what would be the scholarly achievements of three or four or five of our present sophomores, placed in an isolated community with no library, no equipment, and burdened with a varied and heavy teaching load! Even as late as 1878 there were only 3000 volumes in the library. Chancellor Fraser reports that he himself taught in the spring session of 1872 descriptive astronomy, algebra, arithmetic, geography and English composition. In a report to the Board of Regents dated Nov. 13, 1875, Professor Miller says,

"There recited to me during the year ending June, 1875, classes in higher arithmetic, algebra, geometry, trigonometry, surveying, and conic sections . . . At present there are only two classes in mathematics under my charge, the middle and senior preparatory, numbering eighty-one students. At the beginning of the current term the freshmen, sophomore, and junior classes in history and English were assigned to me."

(What a man!) From Professor Patrick's report for 1873-74 we note improvements desired:

"The chemical lecture room in the basement (in which the lectures are now given under the greatest disadvantage) should be partially equipped. It should at least have a floor, a lecture table furnished with gas and water pipes, and a blackboard, none of which it has at present."

Who among us would consider academic life worth while under similar circumstances? How many today would attempt to advance scholarship with such facilities and such loads?

These were the conditions at approximately the end of the first decade of the University's existence. Nevertheless, ten to fifteen years later, this University had in its student body a surprising number of men destined to become world famous scholars; nevertheless, in 1890 it was granted charters from Phi Beta Kappa and Sigma Xi, the first institution west of the Mississippi to be recognized by either of these organizations; and furthermore, in the nine-year period following 1890 its faculty published, in science alone, well over four hundred scholarly books and articles.

This phenomenon of an institution, struggling pitifully for bare existence in the late seventies, transformed a few years later into an institution giving instruction to a score or more of future world-famous scholars, receiving recognition from national honorary organizations long before its neighbors, and possessing a faculty producing scientific research at a rate equalled at few other institutions in the nation, this striking phenomenon must, I believe, contain within itself the story of developing scholarship at the University of Kansas. The facts that explain this transformation are also the facts essential to our discussion here.

Greater financial resources would seem to be the natural explanation. Generally regarded as essential to creative work in a university are salaries with which to attract competent members to the staff, teaching loads which leave unconsumed time and energy, and adequate funds with which to keep the library up to date. But the salary scale at this university was actually lower in the middle eighties than a decade earlier; the entire library in the year 1887 consisted of 8000 volumes; and the teaching loads were not light, a fact made evident by Chancellor Lippincott's comments about Snow in his report to the Board of Regents for 1887-88: "With prodigious industry and with great success he has for many years cared for the entire field of botany, zoology, geology, meteorology and physiology." No, greater financial resources cannot be the explanation of the changes which took place in those few years.

There are, however, some other facts which are so significant that we need to isolate them for individual consideration. I mention first the gradual discontinuance of the preparatory school between the years 1885 and 1890. The enrollment of the first few years after 1866 consisted almost entirely of preparatory students and even at the end of a decade there were twice as many preparatory students as college students. Not until 1885 were the college students in the majority. By 1890-91 there remained only thirty-eight preparatory students and at the end of that year the preparatory department was abandoned. Contacts with the immature minds and the undeveloped interests of preparatory pupils never stimulate either faculty members or college students to scholarly achievements. It is perhaps not entirely accidental that Phi Beta Kappa and Sigma Xi arrived on the campus as the last preparatory student was leaving.

## Snow's Work

I turn next to a further consideration of the service rendered by Francis Huntington Snow from the day the university opened until the end of the century. To the wisdom or the chance which led that first Board of Regents to select Snow, trained in Greek and theology, to serve here as professor of mathematics and natural science, we should remain eternally grateful. Lacking completely facilities for other types of scientific work, he immediately set for himself the task of collecting and classifying specimens, of observing and recording facts, connected with the natural history of this region. It was a virgin field and Snow was quick to see both the opportunities and the obligations.

In April, 1872, he published a catalog of the birds of Kansas in which he listed two hundred and thirty-nine species, of which all but thirty-two were included on the basis of his own personal observations. Supplementary lists were published in October, 1872, in 1875 and in 1876. These were the only facts about Kansas birds published by a Kansan previous to 1878.

The Entomological Collection named in honor of Snow, and to which he contributed vastly both directly and indirectly, is too famous to need comment here. The story is told that Snow could be seen on spring evenings starting at sundown for the Wakarusa River where he would turn his pony out to graze until sunrise, light his bull's eye lantern, take a cyanide bottle and a net, and plunge into the thicket. For years his spring and summer vacation periods were regularly spent on collecting expeditions, frequently in the company of students who had been thrilled by his own enthusiasm. In 1876 five of the eight members of the senior class left immediately after graduation for a camping and collecting expedition with Snow in Colorado. Insects by the score carry Snow's name and will make it immortal in scientific literature.

Three times daily for thirty years or more Snow made and recorded his own meteorological observations. He started the university's collections not only in entomology but also in botany, in geology, in ornithology and in mammalogy, and published from one to seven papers per year during the period 1868 to 1893 on his collections and observations in these and other natural sciences.

It may have been purely accidental but it is nevertheless significant that the same month of 1890 which saw chapters of the two greatest national honorary societies established at this university also witnessed the election of Francis Huntington Snow as Chancellor. To quote S. W. Williston "With him (as Chancellor) the real Kansas University was born." It would be almost equally true to say that with him as chancellor Phi Beta Kappa and Sigma Xi at this university were born. He was a charter member of both chapters, president of Phi Beta Kappa for the first four years, and vice president of Sigma Xi for the same period. Probably the only reason that Snow was not the first president of Sigma Xi was that Phi Beta Kappa was organized first by nineteen days. It was during that nineteen day period, on April 9, 1890, that Snow was elected chancellor.

### Founded Science Bulletin

In his first report to the Board of Regents as chancellor, Snow recommended "The inauguration of a series of official University bulletins through which the investigations and discoveries of our faculty might be made known to the world." The result of that recommendation was the Kansas University Quarterly which later became the present Science Bulletin.

In his second report Chancellor Snow had more to say about research and publication in these words: "Indeed a spirit of active research has pervaded all departments of the institution. It is a matter upon which the friends are to be congratulated that--so large a proportion of the members of the faculty find time to devote to that original research whose published results give a higher standing to an institution of learning than any other cause. Intellectual activity in a faculty will attract that class of students which is the best indication of a true university standard."

This was said in 1892. How much more can we say in 1940?

A building on this campus perpetuates the name of Snow; a truer university is a memorial to his work here.

A third fact of great significance is the stabilization which took place in the membership of the faculty during the eighties. With the exception of Robinson and Snow, members of the first faculty, and Ephriam Miller, who was first appointed in 1874, no member of the staff in the year 1885-86 had served as long as ten years, and only four others, James H. Canfield, F. O. Marvin, James W. Green and W. H. Carruth had served continuously during the previous five years. If the generally accepted theory is true that a heavy turn-over in the faculty is an indication of weakness in an institution, here is evidence that the University of the early eighties was a university in name only.

It was in the year 1882 that a stable faculty began to form. New appointments made during the period 1882 to 1890 included L. L. Dyche, M. W. Sterling, E. H. S. Bailey, L. E. Sayre, A. M. Wilcox, Olin Templin, C. G. Dunlap, F. W. Blackmar, E. M. Hopkins, W. C. Stevens, Hannah Oliver, every one of whom gave more than forty years of continuous service to the university, and five of whom we are most happy to have with us after half a century. There were, moreover, during the same period other notable appointments of men who did not for various reasons remain so long: E. L. Nichols, succeeded in 1887 by L. I. Blake, E. C. Franklin, S. W. Williston, A. G. Canfield, H. B. Newson, Vernon L. Kellogg. With the exception of E. L. Nichols, every one of the twenty-five individuals named was a member of the faculty in that spring of 1890 or was appointed before fall.

It is not necessary to look beyond this group of twenty-five faculty members for the complete explanation of the granting of charters of Phi Beta Kappa and Sigma Xi in 1890 to this poorly supported and illy equipped little institution far out on the western plains. Here is proof that a real university can exist anywhere, at any time, if it only possesses a faculty of sufficient calibre. The unexplained mystery lies in the forces which brought that group together. Did Chancellor Lippincott possess such superior wisdom in the selection of men? Or did he seek wise counsel from Snow and others? Or did it all happen through a fortunate combination of circumstances? Perhaps the Hand of Destiny is again evident.

Mention has been made only of those men and women who had joined the faculty by 1890. Another distinguished group came during the decade of the nineties, beginning with F. H. Hodder in 1891 and ending with H. P. Cady in 1899. It would be a pleasure and a privilege to pay our respects to each of them but time will not permit.

We must return for a moment to that group who formed the faculty in the fall of 1890 to point out the notable fact that a heavy proportion were graduates of the University itself. Carruth, Dyche, Sterling, Templin, Stevens, Oliver, Franklin, Kellogg formed an important element in that faculty even though they were as yet far below their future intellectual statures. An institution which constantly produces from its student body men of greater power than those who have trained them is in a healthy state. The university of the eighties was remarkably strong by that test.

Scholarly interests and achievements on the part of the faculty are chiefly the means to an end, the end being the development of similar interests and potential achievements in the capable members of successive student generations. If this statement is accepted as true, the records of the alumni and former students of a university should give some indication of the scholarly qualities of the faculty thirty or forty or fifty years earlier. While this type of objective test does not, unfortunately, help in judging the faculty of today, sufficient time has elapsed to afford information concerning the faculty of the period between 1885 and 1895. During these years the student body contained a group of men who later became scholars of such distinction that their achievements are familiar to all of us, among them Marshall A. Barber, Barnum Brown, E. C. Case, A. L. Corbin, E. C. Franklin, W. S. Franklin, Herbert Hadley, Vernon Kellogg, C. A. Kraus, C. E. McClung, Elmer S. Riggs, Henry E. Riggs, E. E. Slosson, W. A. White, with no mention of distinguished practising engineers and lawyers and business men, and omitting entirely those graduates who have given their lives to service on this faculty. This record becomes all the more striking when we realize that the average number of college students enrolled each year during that decade was less than five hundred and that the entire number of different college students in the whole ten-year period was probably less than half the number enrolled in any one year at present. That little faculty, varying from twenty-four to fifty-two in number, must have been the world's greatest according to the test suggested.

It was, however, not entirely a one-sided matter; a group of students of such superior intellectual ability must have stimulated many members of the little faculty group to rise to heights far beyond their normal level. Every university instructor should know the thrill, and even the embarrassment, that comes from the impact of a rare intellect in the student-teacher relationship. We hear much these days about the transmutation of chemical elements by bombardment with electrons; that faculty of the late eighties and early nineties must have experienced mental transmutation through bombardments by the Franklins, the Slossons and the Whites.

## Lack of Distractions

It is interesting to speculate on the forces which brought such a remarkable group of students to the university in those few years. A superior faculty; a free and liberal institution; the weakness of competing institutions, especially in science; these are parts of the picture. But, more significant than all else was the character of those Kansas boys and girls. Children of courageous pioneers, mostly of northern European descent, they were accustomed to hard work and few luxuries. Their minds were alert and the modern substitutes for the thought processes were unknown,--jazz, foot-ball, the movie, the radio, the automobile.

In this discussion I have suggested that the speed of development of scholarship reached its maximum in 1890, or, as a mathematician would state it, the slope of the curve became greatest in that year. This does not mean that the slope was negative after 1890, or ever will become negative; the University will be a sorry institution indeed when scholarly efforts begin to shrivel and decay.

How extensive has been the influence of Phi Beta Kappa and Sigma Xi on this campus can never be determined; but it is certain that the decade following the establishment of chapters here was a period of intense scholarly activity on the part of the faculty. As already mentioned more than four hundred books and research articles in science alone were published in those years. The Kansas University Quarterly was started in July, 1892, and, according to a statement on the frontispiece of the first number, it was "Devoted to the publication of the results of research by members of the University of Kansas." Five articles by Williston, three by Carruth and single articles by Kellogg, Newson, Bailey, Stevens, Miller, Blackmar, Hodder, Hopkins, Cady, Bartow, Barber, McClung and others were contained in the first volume. In the ten volumes of the Quarterly seventy-four authors contributed two hundred and forty articles. Some idea of the scope of the activity is given by the fact that this one journal published fifty-eight articles by eleven authors in paleontology; thirty-seven articles by nine authors in entomology; thirty-one articles by nine authors in mathematics, nineteen articles by thirteen authors in geology; twelve articles by nine authors in chemistry. It should be remembered too that this quarterly was not the sole source of publication. During the eleven years from 1890 to 1901, Williston, for example, published ninety-five articles, Bailey thirty-six, Haworth thirty-one, Newson twenty-six, Kellogg twenty-two, Franklin thirteen, with similar figures for many others.

The turn of the century saw our two great honorary societies with a decade of stimulation to scholarship behind them. It saw the beginnings of the Graduate School and the granting of the first doctor's degrees. It saw also the retirement of Chancellor Snow and the breaking of the last faculty link with the University's early struggles. The end of the century seems to mark the end of the developmental period in the scholarly growth of the University, the arrival of maturity. The succeeding years are, moreover, still too close to permit proper appraisal of the University's accomplishments either in research or in student development.

A study of the past is fruitless which does not add to our understanding of the present and of the future. What are the lessons to be learned by members of Phi Beta Kappa and Sigma Xi from the story of developing scholarship in this university? One lesson is that we must strive to keep alive the flame of scholarship, however weak and wherever found. It flickered feebly here for two decades or more and then burst into a brilliance which lights our path after half a century.

## Purpose of a University

Another lesson is that this university and every similar institution must be preserved for its primary purpose, that of developing the intellectual life of its students. A comparison of the university today with the simple institution of the eighties and the nineties shows that strong forces are ever at work toward more immediate and more superficial ends. Who will combat them, if not we who have had opportunities to know the purposes and the satisfactions of scholarly efforts!

A third lesson which comes to us is the great worth of a faculty capable of scholarly growth and able to inspire similar growth in its students. The faculty of 1890 had little encouragement, financial or otherwise, but its accomplishments in scholarly production, and in the stream of inspired students sent forth, form a glorious chapter in the history of this university. That faculty put *first things first*.

Finally, let us not forget that the choicest of American boys and girls have been entering these halls for three-quarters of a century and that they will long continue to seek admission. But hundreds of the best minds graduating from our high schools today are unable to continue their training, here or elsewhere, because of lack of funds. It is our obligation to see that these youths have the opportunities that we have had, not that our colleges and universities may have more students, but that our state and our nation may enjoy the fruits of superior intellects trained to their highest levels. The Summerfield scholarships for boys, the Honor scholarships for girls, and the scholarships for self-supporting students point the way at this university. Many more such opportunities are needed.

These and other lessons from the past show that much remains to be done by the wearers of the keys of the nation's two chief honorary organizations. The preservation, in a healthy and growing state, of our intellectual heritage is not an easy task but one vital to the happiness of the oncoming generations, and even to the existence of the nation itself.

Let us be at the task!

2. Papers on Mathematics Published in the *Kansas University Quarterly* and the *Kansas University Science Bulletin*, 1892-1929.

Papers on Mathematics in the *Kansas University Quarterly*, 1892-1901.

Volume I. July 1892 to April 1893.

H. B. Newson, "Unicursal Curves by Method of Inversion", pp. 47-69.

H. C. Riggs, "On Pascal's Limacon and the Cardioid", pp. 89-94.

Ephraim Miller, "Modern Higher Algebra, Determinants", pp. 133-136.

Volume II. July 1893 to April 1894.

A. L. Candy, "The Trisection of an Angle", pp. 35-45.

H. B. Newson, "The Linear Geometry of the Cubic and Quartic", pp. 85-95.

Volume III. July 1894 to April 1895.

H. B. Newson, "On the Hessian, Steinerian, Jacobian, etc. in the Geometry of One Dimension", pp. 103-116.

Arnold Emch, "On a Special Class of Connected Surfaces", pp. 153-158.

Volume IV. July 1895 to April 1896.

H. B. Newson, "Continuous Groups of Projective Transformations Treated Synthetically", part I, pp. 71-93.

Arnold Emch, "Involutoric Transformations of the Straight Line", pp. 111-118.

H. B. Newson, "Supplementary Note on Continuous Groups of Projective Transformations Treated Synthetically", part I, pp. 169-171.

Arnold Emch, "Involutoric Transformations in the Plane and in Space", pp. 205-218.

H. B. Newson, "Continuous Groups of Projective Transformations Treated Synthetically", part II, pp. 243-249.

Volume V. July 1896 to October 1896.

Arnold Emch, "Projective Groups of Perspective Collineations in the Plane, Treated Synthetically", pp. 1-36. (This is Emch's 1895 Ph.D. Dissertation, but it was published in 1896.)

H. B. Newson, "Continuous Groups of Projective Transformations Treated Synthetically", part III, pp. 81-98.

Arnold Emch, "Theory of Compound Curves in Railroad Engineering", pp. 99-108.

Volume VI A. January 1897 to October 1897.

H. B. Newson, "Types of Projective Transformations in the Plane and in Space", pp. 63-70.

Bessie Eleanor Growe, "On New Canonical Forms of the Binary, Quintic, and Sextic", pp. 201-204.

Volume VII A. January 1898 to December 1898.

H. B. Newson, "Normal Forms of Projective Transformations in the Plane and Space", pp. 125-142.

Volume VIII. January 1899 to October 1899.

H. B. Newson, "The Five Types of Projective Transformations in the Plane", pp. 43-66.

Volume IX. January 1900 to October 1900.

H. B. Newson, "On the Construction of Collineations", pp. 65-72.

Volume X. January 1901 to October 1901.

H. B. Newson, "On the Group of 216 Collineations in the Plane", pp. 13-32.

H. B. Newson, "On the Group and Subgroups of Real Collineations Leaving a Tetrahedron Invariant (A New Theory of Collineations in Space, I)", pp. 33-47.

H. B. Newson, "A New Theory of Collineations in Space, II", pp. 87-99.

H. B. Newson, "A New Theory of Collineations in Space, III", pp. 99-106.

Papers on Mathematics in the *Kansas University Science Bulletin*, 1902-1929.

Volume 1. 1902.

H. B. Newson, "Projective Transformations in One Dimension and Their Continuous Groups", pp. 115-142.

Helen B. Brewster, "On Collineations in Space which Leave Invariant a Quadric Surface", pp. 281-303.

John N. Van der Vries, "On Monoids", pp. 305-322 plus one plate.

Volume 2. 1904.

John N. Van der Vries, "On Monoids (Continued)", pp. 3-18.

Volume 5. 1910.

Arthur Bowes Frizell, "Foundations of Arithmetic", pp. 381-411. (This is Frizell's Ph.D. dissertation; his degree was awarded in 1910. The paper contains a brief biography of Frizell.)

Volume 6. 1911.

Henry Byron Newson, "Theory of Collineations", x + 319 pages, with one plate which shows a photograph of the author.

Volume 7. 1912.

Arthur Dunn Pitcher, "The Interrelation of the Eight Fundamental Properties of the Classes of Functions", June, pp. 1-67. (This is Pitcher's Ph.D. thesis at the University of Chicago. It contains an acknowledgment to Professor E. H. Moore for aid and inspiration.)

R. S. Pond, "Collineations in Space of Four Dimensions", January, pp. 241-259. (Pond received his Ph.D. degree from The University of Kansas in 1910, and, although there is no definite statement, this is probably his dissertation. The paper contains a reference to Professor Newson.)

Volume 9. 1914.

Solomon Lefschetz, "On Cubic Surfaces and Their Nodes", December, pp. 69-78.

Volume 10. 1917.

Solomon Lefschetz, "Note on a Problem in the Theory of Algebraic Manifolds", January, pp. 3-9.

Volume 13. 1920.

H. H. Conwell, "A Special Riemann Surface", May, pp. 41-55.

E. B. Stouffer, "A Calculation of the Invariants and Covariants for Ruled Surfaces", May, pp. 59-71.

Volume 19. 1929.

E. B. Stouffer and R. G. Smith, "Derivation of Certain Relations Involving Sums of Determinants", November, pp. 5-15.

Florence Black, "A Reduced System of Differential Equations for the Invariants of Ternary Forms", November, pp. 17-25.

Wealthy Babcock, "On the Geometry Associated with Certain Determinants with Linear Elements", November, pp. 27-42. (The papers by Florence Black and Wealthy Babcock are their Ph.D. dissertations, written under the supervision of Dean Stouffer, for Ph.D. degrees which they received in 1926.)

3. Address Delivered at Chancellor Strong's Inauguration, by Francis H. Snow. From *The Graduate Magazine*, vol. 1 (1902-1903), November 1902, pp. 45-49 [Snow 2].

On the 12th of April, 1900 [sic], after one year's experience as President of the Faculties, in association with Hon. W. C. Spangler as Vice Chancellor, the present speaker was honored by the Regents of the University of Kansas by election to the Chancellorship. He was the fifth to occupy that responsible and honorable position since the founding of the University in 1864. He was not a candidate for the position and was reluctant to leave his favorite life-long pursuits even to obey the call of that institution whose honor and prosperity were dearer to him than life itself. When he assumed the Chancellorship he was termed "the pioneer professor." He was elsewhere designated as "the veteran educator," and a correspondent of the Chicago Herald had already indicated his estimate of the advanced age of the new Chancellor when he stated that "For nearly a year the Chancellorship had been vacant and old Professor Snow, a respected and mummified member of the Preadamite Order of Silurians, was running the University on a prehistoric basis." In comparison with this estimate all calculations regarding the geological horizon of the famous Lansing man are totally eclipsed. After twelve years experience of executive work, the aforesaid antediluvian appears upon this auspicious occasion before this magnificent audience of his associates in the Faculty and Board of Regents, his former students, his fellow citizens of

Kansas and his educational friends from all parts of the land, to extend his greetings and congratulations to his successor.

No college president could have enjoyed a more hearty co-operation than was mine during the entire period of my administration. Although during eight of its twelve years the Board of Regents was equally divided in political composition, and partisan politicians on both sides sought at times to disrupt the institution by demanding the retirement of certain members of the Faculty on political or personal grounds, the Regents as a whole did not once allow party feeling to prevail, and joined heartily in the endeavor to place the great interests of the University above all considerations of a mere partisan character. Nor could any executive have enjoyed a greater harmony in his Faculty than it was my good fortune to possess. Differences of opinion there were, as there must always be among men whose mental calibre entitles them to membership in a university faculty, but such differences were not allowed to interfere with the advancement of the University. And what shall I say of the student body, for whose development to the highest manhood and womanhood these generous provisions have been made by the State of Kansas? I can only say that there never existed an assemblage of young men and women more free from obnoxious qualities in character and action, more devoted to the true objects of student life, more loyal to the welfare of their alma mater. And never were Alumni more cordial in their friendly aid or more sympathetic in times of stress and strain. How my heart thrilled when, in that dark year of exile from the University, I received from the Alumni telegrams of personal friendship and sincere good wishes for recovery of health! And how my original affection for the grand young State of Kansas has been intensified and stereotyped during the past two years by the universal expressions of good will for myself and for the University!

If I were asked to name the principal features which characterized the growth of the University of Kansas during its fifth executive administration, I should mention the following:

1. The recognition by the Legislature, by the abolition of all tuition and contingent fees, of the important fact that the University is itself an organic institution of the free public school system of the State.

2. The entire exclusion of the Preparatory Department.

3. The establishment of a vital connection with the high schools of the State, by the modification of the admission requirements during the first year of my administration, so that the English language was accepted from candidates for the degree of Bachelor of Arts as a substitute for the second foreign language which had up to that time been required. The example thus set by the University of Kansas has been followed by several of the leading universities of the United States.

4. The increase in the enrollment of students from 505 to 1154, and in the total number of graduates from 465 to 2100.

5. The enlargement of the Faculties of instruction from 34 to 79 members, including the establishment of 20 new professorships.

6. The receipt of private gifts to such an extent that the University of Kansas has received from private sources a larger per cent. of its educational plant than any other State University.

7. The increase of the annual legislative appropriation for current expenses from $75,000 to $135,000.

8. The erection of six new buildings,--three by the State and three by the generosity of Wm. B. Spooner and George A. Fowler.

9. The increase of the number of volumes in the Library from 14,000 to 38,000, and of the material equipments in other departments of the University

to the value of $200,000, including a $5,000 electric pipe organ for University Hall.

10. The addition of eight acres on Oread Avenue to the University campus, and twelve more acres for an athletic field, these gifts having been bestowed by Charles Robinson, Wm. B. Spooner and John J. McCook.

11. The organization of the Graduate School, the enlargement of the Schools of Law and Medicine, and the establishment of the Department of Mechanical and Mining Engineering.

12. The increase of the number of accredited Kansas high schools and academies from 35 to 150.

13. The organization of the State Geological Survey under the direction of the University.

14. The increase of the working force of the executive office. My predecessor had a single clerk, whose chief duty it was to record the grades and receive the tuition and laboratory fees of the students. The cash receipts were taken to the treasurer of the University, who was the cashier of a down town bank and rarely climbed the hill even at the time of Regents' meetings. Chancellor Lippincott had no stenographer and was compelled to write every letter by hand in the good old fashioned way. During the late administration there were, in place of the single clerk of the 80's, a Treasurer and Purchasing Agent, a Registrar, a Private Secretary, a Stenographer and a "guide," all of whom gave their entire time to the executive service.

15. The continued strengthening of the belief by the people of Kansas that the University is their own institution, worthily crowning their educational system. The presence on this august occasion of all sections of the people of Kansas by their chosen representatives is convincing evidence of the truth of this assertion.

And now in closing these remarks I wish to extend to the splendidly equipped gentleman who becomes my successor, my most heartfelt greeting and assurances of earnest co-operation in his chosen work. There is no happier man in Kansas today than the present speaker, because he has been allowed to return to the beloved pursuits of his former life. I bespeak for my successor the equal happiness and the equally congenial labor of raising the University of Kansas to the very first rank among the State universities of this enlightened land.

I look forward with confidence to a period in the life time of many within the hearing of my voice to-day, when by public generosity aided by private munificence, Mt. Oread shall be covered with educational structures, faultlessly planned, devoted to the various departments of science and the humanities, thronged with thousands of students from this and other states, intent upon the greatest possible development of the immortal mind and soul. For the hastening onward of this educational millenium. let every loyal Kansan bend his strongest energies, until no township in this great commonwealth shall be so remote as to fail to receive some degree of inspiration to right thinking and right living from the far reaching and ever elevating influence of the University of Kansas.

4. Preface, "Theory of Collineations", by Henry Byron Newson. From *Kansas University Science Bulletin*, vol. 6 (1911-1912), no. 1, 1911 [Newson, H. B. 11].

In laying before the public the present work on the Theory of Collineations, I wish to say a word on the historical development of the subject and the genesis of my own interest in it, as well as a word on the point of view I have adopted and the methods I have used.

The concept and term collineation* were introduced into geometry by Möbius

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*Möbius tells us in his *Vorrede*, p. xii, that the name was suggested to him by his friend, Professor Weiske.

in his *Barycentrische Calcul* published at Leipzig in 1827. According to his definition of a collineation points correspond to points and straight lines to straight lines, *i. e.*, collinear points to collinear points, whence the name.

We owe to Möbius not only the first clear-cut notion of a collineation and its name, but also the fundamental theorem underlying all his work on this subject, viz., that the cross-ratios of four corresponding elements of two collinear figures are always equal. He also gives us methods for constructing collineations on a line, in a plane, and in space. He shows that three points on a line, four points in a plane, five points in ordinary space, in general $n + 2$ points in a space of $n$ dimensions, determine a collineation in these spaces, respectively. He points out that two conics in a plane are always collinear to one another in $\infty^3$ ways; and that a curve of the $n$th degree corresponds to a curve of the same degree. But I find no hint anywhere in Möbius's work that there are any self-corresponding points, lines, or planes in a collineation.

With the introduction of homogeneous coordinates into analytic geometry there came in a generalized form the old problems connected with the transformation of coordinate axes. Such a transformation is a linear transformation, and hence the theory of linear transformations came to be studied as a subsection of modern analytic geometry. A forward step in the theory of collineations was taken by the English school of mathematicians who founded the invariant theory of linear transformations. This theory took its rise shortly after 1840, and the principal names associated with its early development are those of Boole, Cayley, Sylvester, Salmon.*

Since a linear transformation is a projective transformation, every theorem concerning linear transformations has its bearing on the theory of collineations.

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*See note to Salmon's Algebra, chapter XIII.

The workers in projective invariant theory who considered the geometric applications of their science, looked more to the effect of a linear transformation on a geometric figure than to the properties of the transformation itself. Thus we look in vain through the standard works on invariant theory for a classification of linear transformations or a discussion of their characteristic properties. It was left to men with a different point of view to call the attention of the mathematical world from the effects of a collineation back to the properties of the collineation itself.

In 1844 Hermann Grassmann published his *Ausdehnungslehre*, or Calculus of Extension, and a second presentation of the same subject in 1862. The method of the Calculus of Extension was not applied directly by Grassmann to the study of collineations, but it is capable of application to some phases of the subject. For example, by this method the various types of collineations in ordinary space have been determined. Although the contributions of Grassmann's theory to the theory of collineations have been relatively small, they are perhaps sufficient to warrant the mention of it among the analytic methods of treating the subject of collineations.

The quaternion calculus invented by Sir William R. Hamilton, and published by him in his Lectures on Quaternions in 1844, is an algebra founded on a complex number system of four units. One of its valuable applications is to the theory of homogeneous strains. A homogeneous strain is by definition a collineation, though of a very special kind, viz., one which leaves the plane at infinity invariant. However, the quarternion calculus has not been extensively applied to the theory of collineations in ordinary space, probably because it has not been found to be a suitable instrument for the purpose.

We mention next an analytic method whose most natural and obvious geometrical application is to the theory of collineations. I refer to Cayley's theory of matrices. This theory was set forth in his memoir on this subject in 1858. This subject has never become a popular one among mathematicians in the sense that it has attracted a large number of independent investigators. It did not lead its founder to the general theory of collineation groups, although it has contributed largely, through the labors of Frobenius and others, to some phases of group theory.

In his *Geometrie der Lage*, Nuremberg, 1847-'60, Von Staudt laid the foundations of pure projective geometry in a form independent of the assumptions of measurement, mechanics or congruence, and without quantitative notions of any sort. He distinguishes sharply between Geometrie der Lage and Geometrie des Masses. Pure projective geometry and the theory of collineations may be considered in a certain sense as mutually inclusive sciences. My conception of the distinction between them is expressed by saying that projective geometry deals chiefly with the projective properties of figures, while the theory of collineations considers especially the properties of the projection itself.

About the year 1870 there appeared upon the mathematical stage a new personality, Sophus Lie, from the land of Abel. He brought with him a new and original idea, the notion of a continuous group of transformations. Lie broadened and deepened the already existing notions of a transformation, and developed a complete theory of all continuous groups of transformations, a thirty years' task. Among the many transformations studied by Lie, the first, the simplest, the most centrally situated, and the most far-reaching in its theoretical and practical bearings, are projective transformations or collineations.

Lie's work on the theory of collineations was both synthetical and analytical; synthetical in its earliest conception and announcement, analytical in its final form as presented to the mathematical world in the books published in his later years. Lie throughout kept his eye fixed on the properties of the collineation itself rather than on the effect of the collineation on certain configurations of space. But it is evident that his chief interest in projective transformations was in their group properties, and not in those more fundamental properties which form the natural basis for a classification both of collineations and their groups.

But after all is said the most important and most interesting properties of collineations are their group properties; and no discussion of the theory of collineations is full and symmetrical which fails to lay the major stress on the consideration of the collineation groups. The group of projective transformations, or collineations, is by far the most important of the continuous groups discovered by Lie and developed by him in his "*Theorie der Transformationsgruppen*." This group lies at the very heart and core of his theory for the reason that all finite continuous groups can, by a suitable transformation of variables, be shown to be similar in structure to some projective group. Therefore every contribution to our knowledge of collineations and their groups reacts upon the wider theory of all continuous groups. A transformation of the elements of a space is defined as an operation which interchanges among themselves the elements of a space, but leaves the space, considered as the aggregate of all its elements, unchanged as a whole. The operation may be produced by means of a mechanical device, an analytical formula, a geometrical construction, or in any other way. Sometimes there are several different methods of producing one and the same transformation; but the effect is the same no matter by what method produced. A collineation is defined as one that transforms points into points, lines into lines, and planes into planes. It is, therefore, a self-dualistic transformation.

A collineation may be regarded from two distinct points of view, viz., the analytic and the synthetic. From the synthetic point of view the phenomena of a collineation appeal directly to the eye or to the space intuitions. On the other hand, from the analytic point of view the operation is seen through the medium of a linear substitution on the requisite number of variables. The two methods have long been in use side by side and each has its special advantages. Each also has its special votaries, and each will continue to have its advocates as long as human minds continue to be constructed on different patterns. To me the synthetic method is the more attractive, for the reason that it enables one to get closer to the facts and to view them at first hand. In all applications of analysis to geometry a formula is only the vehicle which conveys the thought, not the thought itself. The inevitable tendency is to confuse the vehicle with the thought, to mistake the vessel for the contents, and to lay hold on the shadow rather than the substance of the thing sought.

My interest in the collineation as an object of research dates from the time when it was my rare good fortune to be a student of Lie at Leipzig in 1887-'88. I followed with special interest his lectures on Modern Geometry and on Continuous Groups. The latter course was afterward published under the title *Vorlesungen ueber Conlinuerliche Gruppen*. Almost every example used to illustrate the theory of continuous groups was a group of projective transformations. Lie's method of approach to the theory of projective groups was through the infinitesimal transformation. I early became dissatisfied with the infinitesimal method because there seemed to me so wide a gap between the analytic processes and the geometric interpretation of the results. I was constantly asking myself the question, whether it was not possible to develop the theory of the projective group directly from the finite form of the equations of a linear transformation or from geometric construction? Lie's analytic method started from the finite form of a linear transformation, descended into the infinitesimal regions where the important analytic work was done, then reascended into the regions of the finite where the results were exhibited.

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NOTE.

The above incomplete draft of the preface probably includes nearly all, except acknowledgments, that the author intended to say. Otherwise the manuscript of this volume was complete and the proof had been read and corrected through to page 272, when his sudden death on the night of February 17, 1910, put an end to his labors. Others, have read the remainder of the proof. Doubtless, errors have crept in which the author would have corrected if he had lived to read the proof himself. It is to be regretted that a series of unfortunate circumstances has so long delayed the publication of this work.

Thanks are due to Dr. Paul Wernicke for assistance rendered the author both with the manuscript and with the proof-reading, also for reading a considerable portion of the remaining proof. I also wish to express my thanks to Dr. U. G. Mitchell for valuable assistance, without which the completion of the publication might not have been possible.

M. W. Newson.

# Chapter 3

## The Beginning of the Long Decline

## 1910-1925

1. Letter, Dated March 18, 1914, from Professor J. N. Van der Vries, Chairman of the Department of Mathematics, to Dean Olin Templin [Records of the Department of Mathematics].

I am sending you herewith the report of the department as asked for in your letter of the 11th inst.

The department of mathematics is now completing its third year of management on a departmental basis. It believes that it has proven that such a system is a working one, and that the department under it has done the work belonging to its field in an effective and successful manner. The department has worked harmoniously no matter to whom the chairmanship has been entrusted. The department believes that its condition is healthful and that it has not only maintained but constantly raised its own standards.

The registration in the department was sent you in detail a few days ago and may be referred to in case you desire to do so. In passing, it may be stated here that

a) During the first term, there was a total enrolment in all classes of 826 with a total of 2209 credit hours, an average of 91.6 students with a total of 245 credit hours for each one of the 9 members of the department; the members of the department teaching on the average 13.8 hours per week.

b) During the second or present semester, there was a total enrolment in all classes of 824 with a total of 2005 credit hours, an average of 72.7

students with a total of 228.8 credit hours for each member of the department; the members of the department teaching on the average 13.9 hrs per week. (The smaller number of students per instructor during the present semester is due for the larger part to the combining in the engineering school of a number of two hour and three hour classes into five hour classes. It is also due to the fact that the department received during the first semester more students who take Algebra and Trigonometry to satisfy group requirements than during the present semester, and it is therefore able to devote more time to those students who take mathematics absolutely from choice.)

In addition to being surpassed in total enrolments by only two departments, viz. English and History, the department ranked in graduate enrolments at the time of the latest survey (see the Survey of the University of Kansas, 1912 to 1913) ahead of any scientific department. From an average total enrolment, five years ago, of not more than 20 in all classes having 5 hours of the Calculus as a prerequisite, the department during the past three years has had an average enrolment for such courses of 61 per semester. The enrolment of the present semester is 66, exclusive of the additional advanced mathematics required of engineers during the past two years and also of the enrolments in practice teaching, both of which might be included in this category.

A mathematics club organized two and a half years ago has developed into one of the strongest university organizations, the members of the club having become thoroughly imbued with the investigating spirit, the names of a number of them appearing at frequent intervals in the solutions of problems published in various mathematical journals.

The department club organized three years ago among the members of the department meets regularly and hears the reports of the work being done by the various members in their respective fields.

The work in the Summer Session has been developed especially along advanced lines, so that it is now possible for teachers in High Schools and for the instructors in the colleges of this and other states to obtain their advanced degrees entirely by summer work, a situation in which the University of Kansas is not surpassed, if equalled, by any university west of Chicago. Four advanced courses of this kind are being offered in the summer session of 1914.

Graduates of the department during the past three years are holding important fellowships at Chicago University and Clark University, and one, Mr. Gilman, with no other training than that obtained while working for an A. B. at the University of Kansas is holding an instructorship at Princeton University.

The department has had enrolled in its classes during the past three years graduates of the following universities and colleges:-

| | | |
|---|---|---|
| Baker University | Illinois University | New Mexico University |
| Chicago University | Indiana University | Ottawa University |
| Cornell University | Upper Iowa University | Kansas State Normal |
| Bethany College | McPherson College | Wm. Jewell College |
| Blue Ridge College | Midland College | Yankton College |
| Emporia College | Southwestern College | Missouri State Normal |
| Highland College | Wheaton (Ill.) College | |

in addition to its own graduates. The courses have been outlined with great care not only for the undergraduate and the graduate student of the University of Kansas but also in such a way that the graduate of the smaller colleges may carry on his work with dispatch and profit but also that the graduate of institutions of our own rank may carry on their lines of investigation and research. The age of the fields of mathematics makes necessary a much longer period of preparation than is the case in many of the newer sciences in more virgin fields and it is accordingly much less prolific in results. Students are therefore of real graduate calibre before they are productive, the masters theses in the library showing the result of their work. The one aim of the department in the last three years has been the accomplishment of the greatest good to all concerned by placing every course as far as possible in the hands of that member of the department most competent to handle the same. Its plan for the future is the still further upbuilding of the advanced and graduate courses by placing them on such firm foundations that they command the ever increasing respect of those competent to judge, of producing a spirit of research in the department which is ever on the increase but which does not forget that the first function of an instructor is to impart in an ever more successful manner his knowledge to those whom he is engaged to teach.

In its personnel, the department is equipped by preparation and experience in a manner not equalled by any of the other large departments of the University, 6 out of 9 members of the department possessing the degree of Doctor of Philosophy, 2 from Chicago University [sic], 2 from Clark University, 1 from Munich and 1 from Princeton. And this in spite of the fact that [in mathematics] it takes more years of work to obtain the doctorate than in any other department. The members of the department are working on problems in their respective fields, Professor Van der Vries in Modern Geometry and Projective Geometry, Professor Ashton in the Theory of Functions, Professor Mitchell in the pedagogy of mathematics especially with reference to the reorganization of the material in secondary mathematics, Doctor Lefschetz in Geometry and Professor Jordan in engineering mathematics.

The library is in a healthy condition. There are still a number of leading journals lacking which will have to be supplied by special appropriation in the years to come. The additional $180.00 received during the present year is being used to fill up gaps in the journals now in the library and was much appreciated.

The appropriation of $250.00 for equipment has placed the departmental equipment in a good condition. The department feels that for a few years at least this could be reduced to $100.00 without injury to the department. If the $150.00 could be transferred to the library fund it would be of great benefit, as the library always has been and always will be the laboratory of the mathematical student.

The department wishes to recommend that it be continued on a departmental basis as has been the case during the past three years. It feels moreover that its position in the university entitles it to a recognition which it does not now receive. It believes that it is entitled to two professorships from its present membership, even if an additional professor were brought in from the outside. The only two departments which surpass it in total enrolment have two professors each: the English department with a Professor of Eng. Lit. and a Professor of Eng. Language, and the department of History with a Professor of American History and a Professor of European History. The department of Chemistry with 25 per cent less enrolment has three professors and the departments of Botany, Bacteriology, Entomology and Zoology with a combined enrolment 16 per cent less than the department of mathematics have a total of 4 professors. At the University of Nebraska with a smaller enrolment in mathematics classes and with a department not the equal in any sense of that at the University of Kansas there are three professors of mathematics, at the University of Missouri there are two. Moreover the department of mathematics has received during the past three academic years in its permanent personel [sic] a total increase in salaries of only $500.00. The average years of experience (according to the General Survey above mentioned) of the members of the department of History was 11 years, of the department of English was 12 years and of the department of Mathematics was 14 years. The percentage of Ph. D.'s in the department of History at that time was 50 per cent, in the department of English 29.4 per cent and in the department of mathematics was 62.5 per cent. (Since that time the percentage in the department of mathematics has been increased to 66+) And yet the average salary in the department of History was $1883, in the department of English $1423 and in the department of mathematics $1325. These figures compare the department of mathematics with all the departments which exceed it in total enrolments. Similar and even greater discrepancies occur if the comparison is made with any department which has a smaller enrolment with the exception of Romance Languages (and the preparation of the members of this department is not to be compared with that of the department of mathematics.) Compare the department of mathematics with the department most closely allied to it, namely, Physics, with a total enrolment of 1225 as opposed to 2748 hrs in mathematics. The total number of instructors in the department of Physics was 5, the total budget for salaries $7900, an average of $1580 per man as compared with $1325 in the department of mathematics. Or choosing a small department as Entomology with two instructors a total enrolment of 154 hrs, a budget of $3400 or an average of $1700 per man. Or, finally, compare with the total of 162 instructors in the university at the time of the report, with a total budget of $249,250, an average of $1538 per instructor as compared with $1325 in the department of mathematics.

The Department believes that the work of Professor Van der Vries and Professor Ashton entitle them to promotion to professorships. If any distinction in titles is to be made, it believes that the work of Professor Ashton in organizing and supervising the work in the School of Engineering has qualified him for the position of Professor of Applied Mathematics, but with the distinct understanding that the latter appointment implies in no way a division in the department.

The department also believes that Professor U. G. Mitchell is entitled to promotion to an associate professorship, on account of his efficient work in the department as well as in all lines of university activity, and in particular in connection with the School of Education, The Oread Training School and the teaching of mathematics in the state.

The department believes that Professor Marion B. White is entitled to promotion to an associate professorship on account of her effective work in the department and in addition on account of her work and influence among the young women of the university, as well as her untiring energy in other lines of university activity.

The department believes that the work of Mr. Wheeler as instructor in the School of Engineering is such that his salary should be increased to $1200 but with no promotion in rank. The grade of work performed by Mr. Wheeler as instructor of engineering students is of such quality that he could not be replaced by a salary much greater than that asked.

The department believes that the work of Mr. Conwell is of such nature that his salary as instructor should be advanced to $1000.

Professor Jordan having served with satisfaction for three years at $1200 is due an automatic increase of $100 and the department feels that it should be granted him.

The increased budget along the lines of the above recommendations is tabulated below. In the first column is the budget of the present year, in the second column the natural budget for next year if automatic increases are allowed, and [in] the third column [is] the budget according to the above recommendations. There is in the total of this third column an increase of $1050 over the budget in the second column. There has however been in the budget for the department up to the present year an allowance of $2500 for a professorship. Of this $1200 has been used during the present year as the salary of Dr. Lefschetz, leaving a remainder of $1300 this year as well as next year to cover the additional $1050 in the proposed budget. The proposed budget is therefore $250 less than the budget previously planned for the department allowing for automatic increases.

| | | | |
|---|---|---|---|
| Van der Vries | 2000 | 2000 | 2200 |
| Ashton | 1800 | 1900 | 2200 |
| Mitchell | 1400 | 1500 | 1700 |
| White | 1300 | 1400 | 1700 |
| Jordan | 1200 | 1300 | 1300 |
| Duval | 1200 | 1200 | 1200 |
| Lefschetz | 1200 | 1200 | 1200 |
| Wheeler | 1000 | 1100 | 1200 |
| Conwell | 900 | 900 | 1000 |
| | 12000 | 12500 | 13700 |
| Equipment | 250 | 250 | 100 |
| | 12250 | 12750 | 13800 |

The department is convinced that it is not asking for anything which in all reasonableness and fairness is not its due.

2. Department of Mathematics Budget Proposals for the Years 1916-1917, 1917-1918, and 1918-1919, Submitted by Professor J. N. Van der Vries, Chairman, to Dean Olin Templin, October 25, 1916 [Records of the Department of Mathematics].

October 25, 1916

Professor Olin Templin,
Dean of the College, University of Kansas.

My dear Dean Templin:

On receipt of your letter of the 7th inst. I called together the department of mathematics and presented to it your request for a prospective budget for the biennium 1917-1919. After mature deliberation the department voted that each of its members send to the chairman a detailed statement of the views of the member on the departmental budget, emphasizing any discrepancies as to salary and rank which the writer believes to exist in the department, no writer to refer either to his own case or to that of the chairman. In this manner the case of each member of the department with the exception of the chairman has been considered by the nine other members of the department. The department emphasized that these letters to the chairman were to be considered as confidential by him and instructed him to take the arithmetical average of the various recommendations and to present to the Dean a budget as nearly as possible in conformance with the combined judgment of the department as manifested by these confidential letters.

The vote of the department indicated that three members of the department are deserving of special consideration, viz., Professors Mitchell, Stouffer and Lefschetz. The department believes that the increases shown on the accompanying sheet are on a ratio which will in a few years eliminate any discrepancies now existing. I shall give here some of the reasons for the singling out of the above three men.

Professor Mitchell's general mathematical equipment, his efficient service in charge of the education work of the department, his contributions to mathematical interests both in the state and abroad, his activity in general university interests and his exceptional ability as a teacher are all such as to warrant material consideration.

Professor Stouffer's mathematical knowledge, his ability as a teacher and his good judgment in departmental affairs, his interest in the class room and along research lines are all so manifest as to warrant his promotion to an associate-professorship in 1917 and to immediate consideration financially of a pronounced character.

Professor Lefschetz's ability as a mathematician and as a producer along original lines are such as to give him a first class reputation abroad and are moreover such as to leave no doubt as to justice of his monetary advancement. He is the most productive man of the department.

My dear Dean Templin: I have attached three separate budgets, one a conservative one, one a budget in keeping with the first as to ratio and also in keeping with the increased cost of living, and third one a compromise between the first two. I shall leave to your more mature judgment the question of which of these three budgets should be submitted to the Chancellor with your approval.

| | 1916-17 | 1917-18 | 1918-19 |
|---|---|---|---|
| Van der Vries | 2400 | | |
| Ashton | 2300 | 2300 | 2400 |
| Mitchell | 1800 | 1900 | 2000 |
| Stouffer | 1600 | 1700 | 1800 |
| Jordan | 1500 | 1500 | 1600 |
| Wheeler | 1300 | 1300 | 1400 |
| Lefschetz | 1300 | 1400 | 1500 |
| Steimley | 1000 | 1100 | 1100 |
| Larsen | 1000 | 1000 | 1000 |
| Miller | 900 | 1000 | 1000 |
| New Man | | 900 | 1000 |
| Equipment | 100 | 100 | 100 |

This budget represents the most conservative view of the department. It is a budget which should be adopted even if no great increase in appropriations is received. It is an attempt to even any discrepancies now existent and is a minimum budget in every respect.

Yours most Cordially,

| | 1916-17 | 1917-18 | 1918-19 |
|---|---|---|---|
| Van der Vries | 2400 | | |
| Ashton | 2300 | 2500 | 2700 |
| Mitchell | 1800 | 2100 | 2400 |
| Stouffer | 1600 | 1900 | 2200 |
| Jordan | 1500 | 1700 | 1900 |
| Wheeler | 1300 | 1500 | 1700 |
| Lefschetz | 1300 | 1600 | 1900 |
| Steimley | 1000 | 1200 | 1300 |
| Larsen | 1000 | 1100 | 1100 |
| Miller | 900 | 1000 | 1100 |
| New Man | | 1000 | 1100 |
| Equipment | 100 | 100 | 100 |

This budget represents the value of present budget increased according to the advance of cost of living and is a budget which must be approached if the efficiency of the departmental faculty is to [sic] maintained at its present level, making no allowances for an increase in the present standards. It costs more and more to attend conventions, expenses which must be met out of the margin of a man's salary, and at present there is no margin. Efforts should be made to have this accepted "in toto."

Yours most Cordially,

| | 1916-17 | 1917-18 | 1918-19 |
|---|---|---|---|
| Van der Vries | 2400 | | |
| Ashton | 2300 | 2400 | 2500 |
| Mitchell | 1800 | 2000 | 2200 |
| Stouffer | 1600 | 1800 | 2000 |
| Jordan | 1500 | 1600 | 1700 |
| Wheeler | 1300 | 1400 | 1500 |
| Lefschetz | 1300 | 1500 | 1700 |
| Steimley | 1000 | 1100 | 1200 |
| Larsen | 1000 | 1000 | 1100 |
| Miller | 900 | 1000 | 1100 |
| New Man | | 1000 | 1100 |
| Equipment | 100 | 100 | 100 |

This budget represents the most conservative opinion of the department with a conservative increase to meet the increased cost of living. It is a budget which should in all equity be the minimum to be adopted. The department's efficiency will be impaired if this is not adopted.

Yours most Cordially,

3. Department of Mathematics Staff, 1910-1925.

| | |
|---|---|
| * John Nicholas Van der Vries | 1901-1918 |
| * Charles Hamilton Ashton | 1903-1936 |
| * Ulysses Grant Mitchell | 1906-1942 |
| * Arthur Dunn Pitcher | 1906-1911 |

* See Appendix IX for biographies from *American Men of Science*.

| | | |
|---|---|---|
| | Marion Ballantyne White | 1910-1914 |
| * | Arthur Bowes Frizell | 1909-1912 |
| * | George Wellman Hess | 1910-1911 |
| * | John Wesley Young | 1910-1911 |
| * | Jasper Ole Hassler | 1911-1912 |
| * | Herbert Edwin Jordan | 1911-1948 |
| | Hazel Hope MacGregor Rice | 1911-1913, 1917-1918, 1919-1921 |
| * | Alfred Lewis Nelson | 1911-1912 |
| | John Jefferson Wheeler | 1911-1947 |
| * | Edmund Pendleton Randolph Duval | 1912-1914 |
| * | Herman Henry Conwell | 1913-1915 |
| * | Solomon Lefschetz | 1913-1924 |
| * | Ellis Bagley Stouffer | 1914-1955 |
| | Edward Hegeler Carus | 1914-1915 |
| * | Karl John Holzinger | 1915-1916 |
| | Arthur William Larsen | 1915-1918 |
| | Leonard Leo Steimley | 1915-1917 |
| * | Earle Brenneman Miller | 1916-1918 |
| | Florence Black | 1918-1960 |
| | Anna Marm | 1918-1921 |
| * | Cyril Arthur Nelson | 1919-1920 |
| * | Cornelius Gouwens | 1919-1920 |
| | Thomas Bravais Henry | 1920-1922 |
| * | Guy Watson Smith | 1920-1956 |
| | Wealthy Babcock | 1920-1966 |
| | Raymond Hamilton Carpenter | 1920-1923 |

* See Appendix IX for biographies from *American Men of Science*.

| | | |
|---|---|---|
| | Nina Mildred McLatchey | 1920-1922 |
| | Nellie Mary Young | 1920-1921 |
| * | Helen Mary Walker | 1922-1925 |
| * | Paul Althaus Smith | 1921-1923 |
| | Otto B. Loewen | 1921-1922 |
| | Walter Z. Bagley | 1922-1923 |
| | Edith Steininger | 1922-1924 |
| | Lucretia Mae Switser | 1923-1925 |
| | Helen Rose Garman | 1923-1924 |
| * | Charles Arthur Messick | 1923-1925 |
| * | Robert Houghton Marquis | 1924-1925 |
| * | Charles Arthur Reagan | 1924-1928 |
| * | Ronald Gibson Smith | 1924-1927, 1928-1930 |
| | P. F. Wall | 1924-1926 |

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* See Appendix IX for biographies from *American Men of Science*.

# Chapter 4

## Depression, Drought, and World War II

## 1925-1945

1. "Charles Hamilton Ashton, Scholarly Gentleman", by U. G. Mitchell. From *The Graduate Magazine*, vol. 35 (1936-1937), November 1936, no. 3, p. 9-10 [Ashton 2].

It was my good fortune to become acquainted with Professor Ashton the next year after he began teaching in the University of Kansas. During a large part of the thirty-two years of our association together we occupied the same small office, our desks only a few feet apart.

When two men in the same profession office together, play golf together, talk shop, business, politics and religion together for many years, they come to have an understanding of each other's moods, mental attitudes and essential characters far beyond that of the earlier years of their acquaintance. Our long association together gave to me a high appreciation of certain fine qualities in Professor Ashton which may, to some extent, have escaped the notice of his casual acquaintances and even of those who had known him through business and professional contacts for a considerable number of years.

In the limited space at my disposal I can speak of only a few of these qualities. One of the finest of them was a forthrightness in taking at once the side he thought was right regarding any moral question. His principles were inflexible and he never hesitated in making a moral decision. There was that about him which suggested the Scotch Covenanter and the granite hills of New England. In fact, he was descended on his mother's side from the

Reverend Thomas Beveridge, a native of Fifeshire in Scotland and the first minister in the Cambridge valley of eastern New York where, in 1866, Professor Ashton was born within a few miles of the Green Mountain State. On his father's side he was descended from Major James Ashton, a soldier from Cambridge in the Revolutionary War, and his own father, Doctor John Ashton, was for four years a surgeon in the Union Army during the Civil War. Convictions and the courage to abide by them and to defend them were Professor Ashton's by right of heritage.

Another admirable quality in Professor Ashton was his high ideal of scholarship. He attended a rural school near Cambridge (N. Y.) until he was eleven years of age. By that time he had mastered the arithmetic and grammar taught there and during the next year he was taught Latin, algebra and geometry by an older sister at home. At twelve he entered the high school at Greenwich, N. Y., from which school he graduated at fifteen. At the age of sixteen he entered Union College at Schenectady. When he graduated from Union College in 1887, one of his teachers, Prof. H. Whitehouse, professor of Greek, wrote of him: "I am able to testify from personal knowledge to his successful diligence as a student, and to the uniform propriety of his conduct, whereby he obtained for himself the respect and affection of his instructors." High compliments from professors of Greek may have been bestowed upon trackmen (for Professor Ashton won a medal in the races at Union while he was a student there) more often then than now, but one has a feeling that they were not very common, even in those days.

His scholarly record at Union and the recommendations of his professors brought him immediate appointment as a teacher of mathematics in a private Episcopal school for boys at Oakfield, N. Y. He remained at Oakfield for two years, when, at the age of twenty-three, he was elected professor of mathematics in the State Normal School at Mansfield, Pa. It was at Mansfield that he met Miss Cora Phillips of Scranton as a student in one of his classes. Ambitious to secure the best instruction in his chosen field, he entered Harvard University for graduate study in 1892 and secured there the Master of Arts degree in 1893. After his election as an instructor at Harvard in 1894 he and Miss Phillips were married. After nine years of teaching in Harvard University, he came to the University of Kansas in 1903 as assistant professor of mathematics. Here the two daughters, Madeline, now a teacher of romance languages in Kansas City University, and Annette, now Mrs. Leon Bocker of Seattle, Wash., grew to womanhood and were graduated from the University.

Students in his classes here soon learned that loafers and incompetents would have a hard time of it and that the student who received a good grade must convince the professor that he had acquired the degree of mastery which the professor associated with that grade. But they also learned that Professor Ashton was willing to give time and effort to help the student who was doing his best. Many students who were not at first attracted by his class-room ways developed for him a most sincere affection as they continued to take more advanced courses under his instruction. Students always recognized his scholarly mastery of the subjects he taught and the thoroughness of his teaching.

His desire for still higher scholarship led him to secure leave of absence for the year 1908-09 and take his family with him to Munich, Germany, where he received the degree of Doctor of Philosophy in 1909. I believe that he was the first American to receive this degree from the University of Munich after only one year of resident work there. His Doctor's thesis, entitled "Die Heinischen O-Funktionen," was published at Munich in 1909.

In collaboration with Walter R. Marsh, formerly head master Pingry School, Elizabeth, N. J., Professor Ashton published a series of four mathematical textbooks: Analytical Geometry (1900), Trigonometry (1902), Elementary Algebra (1905), and College Algebra (1907). These books were concise and scholarly. They were immediately successful and sold well for a considerable period of years.

In recognition of Professor Ashton's success as scholar, author and teacher, his alma mater, Union College, conferred upon him the honorary degree of Doctor of Science in 1922.

As chairman of the department of mathematics he proved himself an able and judicious administrator. His interests, however, extended to the teaching of mathematics in the whole state and he was always present, until failing health prevented, at all important meetings of the Kansas teachers of mathematics. His loss will be keenly felt in their Association work.

A fondness for sports and games added much to his enjoyment of life and perhaps aided in lengthening his years to the full measure of the traditional three score and ten. In his younger years he liked to hunt and, later on, while vacationing in Estes Park, where he long maintained a summer home, he took many a trout from the Big Thompson river. Whenever he played a game he played it with zest and all who accepted a challenge from him for golf or billiards will recall what pleasure he derived from skillful playing of those games.

Anyone who occupies for thirty-three years a position of responsibility and leadership in a University such as ours, must influence greatly the policies of administration, the views of other members of the faculty and the lives of students. So it was with Professor Ashton and we shall greatly miss the active force of his life in our midst. As we realize something of our individual and collective loss we paraphrase Bassanio's famous tribute to Antonio and say

. . . . . . . . . . the kindest man,

The best condition'd and unwearied spirit

In doing courtesies; and one in whom
The old New England honour more appeared,
Than any that drew breath among the Puritans.

2. Resolution of the University Senate in Memory of Professor Ashton, Adopted November 4, 1936 [Ashton 3].

When a man has established himself as a part of the University and come to the end of long service while still at his work, it is fitting that the University put into its records some statement of what that man was in himself and of what he was in the life of the school. Accordingly the undersigned committee submits to the University Senate the following statement concerning the life and work of Professor Charles Hamilton Ashton.

Professor Ashton came to this University in 1903 from an instructorship in Harvard University. From that time until the end of the last school year he served the University continuously except for one year spent in study in Germany.

By constant devotion to his work and by the growth that comes with years to able men, he rose from rank to rank in the Department of Mathematics until he became its Chairman. After many years of wise and judicious service in that office, he voluntarily resigned his administrative duties when he became conscious that they were taking too large a portion of his impaired strength. Long before the time of his death he had gained distinction among contemporary mathematicians for his efficient teaching, his scholarly ideals and his authorship of a successful series of textbooks.

One of the finest of Professor Ashton's qualities was a forthrightness in taking at once the side he thought was right regarding any moral question. His principles were inflexible and he never hesitated in making a moral decision. There was that about him which suggested the Scotch Covenanter and the granite hills of New England. In fact, he was descended on his mother's side from the Reverend Thomas Beveridge, a native of Fifeshire in Scotland and the first minister in the Cambridge valley of eastern New York where, in 1866, Professor Ashton was born within a few miles of the Green Mountain State. On his father's side he was descended from Major James Ashton, (who) was for four years a surgeon in the Union Army during the Civil War. Convictions and the courage to abide by them and to defend them were Professor Ashton's by right of heritage.

Among the things which go into the pattern of a life are also the things done for the sheer joy of doing them. At one time Professor Ashton took up photography to such good purpose that his prints of noted pictures sold in the market along with the most famous prints in America. But the recreative activities he loved most were those of out-door life. He hunted through the Adirondacks. He fished in New England and in Colorado. He was an enthusiastic golfer as long as his health permitted. He loved beauty of sound and of color. He enjoyed good music. He cultivated such flowers as yielded beauty of bloom--peonies, irises, poppies, and roses.

The golf, the gardening and most of the fishing he gave up when he found that his heart was failing; but he did not lose his interest in life or his interest in his regular work. Few men work as long as he did in the shadow. During his last years he lived quietly and earnestly, doing his work and taking such pleasure as he could, walking uprightly and honestly, accepting the inevitable without flinching. The memory of his brave, scholarly and upright life will long remain to comfort those who mourn his passing.

In recognition of the long and faithful service Professor Ashton gave to this University and in grateful tribute to his memory, your committee recommends that the foregoing statement be spread upon the minutes of the Senate and that copies be sent to his widow and to his two daughters.

Respectfully submitted,

F. E. Kester
C. M. Young
U. G. Mitchell, Chairman

3. "U. G. Mitchell, Genial Professor", from *The Graduate Magazine*, vol. 33 (1934-1935), December 1934, no. 3, p. 8 [Mitchell 3].

"I have never played a game in my life that I didn't like," said Ulysses Grant Mitchell, head of the department of mathematics to the *Graduate Magazine's* prying reporter. When a boy going to country school Mr. Mitchell won quite a reputation locally as a checker player, but after taking up chess the checkers were entirely forgotten. Chess has always been his favorite game.

His interest in mathematics and its history is sincere, and seems to coincide with his liking for games, shown by the fact that he has a hobby of collecting old mathematics books. He has a collection of several hundred. They are written in Latin, German, and French to a large extent. Many of them were collected in Europe when he was there with Mrs. Mitchell in the spring and summer of 1932.

One of the earliest incidents Mr. Mitchell remembers was the time he nearly had his life "snuffed out" when he was 6, by a swing breaking and the swing pole striking him. A small scar from the accident is still visible between his left eye and his nose.

Living in an Irish-Catholic neighborhood in Nashua, Iowa, from his birth until he was 12 years old, "which accounts for some things," he says, he received his early training. Only a few of us know what he means when he says, "which accounts for some things." The professor has a quiet and agreeable manner until he is "riled," by someone's treachery or other double dealing--and then he speaks with surprising frankness. In the spring of 1885 he came to Kansas in a prairie schooner. The family settled near Peabody, on the very site where is now the "Watchhorn" oil well.

His life during grade and high school in Peabody means something to him. "I herded 160 herd of cattle at a time when I was 13," he said, "and during my high school days earned my way working in a grocery store."

From an old army officer, who was superintendent of the Peabody high school at that time, Mr. Mitchell gained his first interest in mathematics. Incidentally, his first training as a teacher was in this school before he received his diploma. The superintendent was ill for a month and the schoolboy Ulysses, then a senior, taught his classes during that time.

A twinkle came into the Professor's eyes when he told of the rivalry between Mrs. Mitchell and himself in their scholastic ratings through school. They met when they were in the eighth grade. Mrs. Mitchell had held first place in her classes until Ulysses came along. Inasmuch as the two were always challenging each other in school work, a feeling of dislike, or perhaps we should call it jealousy, was created for a short time. But everything seems to have turned out all right, even though the Professor led as valedictorian and Mrs. Mitchell came out second best.

After graduating from high school, for three years Mr. Mitchell taught a country school, where he had as many as 50 boys and girls for pupils. Then he attended the University of Nebraska a year, and then a normal school, where he taught mathematics and German besides going ahead with his school work. He was married immediately following his normal training work and then held the position of superintendent of schools at Hillsboro from 1898-1902.

His appearance at the University of Kansas was in 1904 after being superintendent of the Lyons schools the two years previous. When the course in American Government was first put into the University curriculum in 1905, Mr. Mitchell taught it. He had enough requirements for a degree at that time, but it was not conferred until Commencement in June of 1906. Then in the fall of 1906 he became instructor in mathematics and worked his way up until he now is head of the department. He received his Master's degree at the University in 1907, and his Doctor's degree from Princeton in 1910.

A medium sized man with wavy gray hair, which he said was once brown, and smiling brown eyes, Professor Mitchell is a likeable person. A wrinkled brow, showing hard work and concentration, impressed it upon me that he is a man of no little intelligence. He has ruddy cheeks reflecting a health above par and he always carries himself with a step that is yet light.

Professor Mitchell is one of the most faithful committeemen that the University has ever known. He will well be remembered for his work as chairman of the committee on, "Relations with Other Educational Institutions." He was chairman of this committee for ten years, and has only recently been relieved at his own request. His work on the Junior College committee, and the committee that organized the Memorial Union in 1927-28 are certainly worth mentioning. At the present time he holds the chairmanship of the University Survey Committee which has been meeting regularly for the past year and a half.

Interested in Christian work, he has been a deacon in the Plymouth Congregational Church at Lawrence for many years. Formerly he was vice-moderator of the state Conference of Congregational-Christian churches, and has been moderator of the eastern association for the past two years. This summer he attended the national council of Congregational-Christian churches at Oberlin, Ohio, as a delegate. He also served as an active member of the

Y.M.C.A. board at the University for several terms some years ago.

With a decidedly worried look on his face, Professor Mitchell told me that he had had a very uneventful life. But, from the number of activities he has had and the amount of work he has done, I should say if everyone had done anywhere near what he has done there would be little left to do. His life has not been especially full of great adventure, and yet has not been at all dull, --one of genuine service to more than a few people, and to human institutions.

4. Department of Mathematics Staff, 1925-1945.

| | |
|---|---|
| * Charles Hamilton Ashton | 1903-1936 |
| * Ulysses Grant Mitchell | 1906-1942 |
| * Herbert Edwin Jordan | 1911-1948 |
| John Jefferson Wheeler | 1911-1947 |
| * Ellis Bagley Stouffer | 1914-1955 |
| Florence Lucile Black | 1918-1960 |
| Wealthea (Wealthy) Consuelo Babcock | 1920-1966 |
| * Guy Watson Smith | 1920-1956 |
| * Ronald Gibson Smith | 1924-1927, 1928-1930 |
| * Charles Arthur Reagan | 1924-1928 |
| P. F. Wall | 1924-1926 |
| Zella E. Colvin | 1925-1927 |
| Howard K. Hughes | 1925-1927 |
| Maude Long | 1925-1927 |
| Helen K. Stevens | 1926-Deceased Dec. 4, 1928 |
| J. R. Jenison | 1927-1928 |

* See Appendix IX for biographies from *American Men of Science*.

| | | |
|---|---|---|
| | George J. Heald | 1927-1929 |
| | Mabel O. Penrod | 1927-1928 |
| | Alida Braucher | 1927-1931 |
| | Corinne Hattan | 1927-1931, 1935-1937 |
| | Edwin W. Titt | 1928-1929 |
| | Alice Winkley | 1928-1929 |
| | Paul Eberhart | 1929-1930 |
| | George S. Cook | 1929-1930 |
| | Billy Moore | 1930-1932 |
| | Eula Johnson | 1930-1933 |
| | Iva Oman | 1930-1932 |
| | Winona Venard | 1930-1934, 1942-1946 |
| * | Gilbert Ulmer | 1931-1934, 1939-1974 |
| | Niel F. Shell | 1931-1932, 1933-1934 |
| | Albert Palmerlee | 1931-1933, 1937-1939 |
| | Thomas Palmerlee | 1931-1933, 1937-1939 |
| | Nora E. Evans | 1934-1935 |
| | James K. Hitt | 1934-1936 |
| | Walter Simmons | 1934-1936 |
| | Reid Hemphill | 1935-1938, 1939-1940 |
| * | Philip Osborne Bell | 1936-1955 |
| | Wilmont Toalson | 1936-1937 |
| | George Milne | 1936-1937 |
| | Alfred Baldwin | 1936-1938 |
| | Griffith Baley Price | 1937-1975 |

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* See Appendix IX for biographies from *American Men of Science*.

| | |
|---|---|
| Marie Brown | 1937-1938 |
| Edison Greer | 1938-1940, 1945-1946 |
| Claude H. Brown | 1938-1940 |
| Marlow Canon Sholander | 1938-1940 |
| Merle L. Demoss | 1939-1942 |
| L. Raymond Shobe | 1940-1941 |
| William Calvin Foreman | 1940-1941, 1946-1948 |
| Otis Clark Moots | 1940-1942 |
| Kathleen Torbert | 1940-1944 |
| Robert S. Pate | 1941-1942 |
| Minnie Robertson | 1942-1947 |
| Martha Elizabeth Peterson | 1942-1952 |
| Magda Jensen | 1942-1945 |
| Gerhard Karl Kalisch | 1942-1944 |
| Norman Wyman Storer | 1942-1943 |
| Jesse L. Brenneman | 1942-1943 |
| Marvin E. Rolfs | 1943-1947 |
| Lucy Dougherty | 1943-1947 |
| Anna Marm | 1943-1944 |
| Joseph F. Wilkins | 1943-1944 |
| William D. Paden | 1943-1944 |
| Clayton M. Crosier | 1943-1944 |
| Emil B. Dade | 1943-1944 |
| Richard S. Howey | 1943-1944 |
| Arthur J. Mix | 1943-1944 |
| - - - Schwerdtfeger | 1943-1944 |
| - - - Dooley | 1943-1944 |

| | |
|---|---|
| Genevieve Fisher | 1943-1944 |
| Henry Holtzclaw | 1943 |
| Robert R. Russell | 1943 |
| L. R. Johnson | 1943 |
| Frank Jirik | 1943 |
| - - - Stewart | 1943 |
| - - - Wade | 1943 |
| George Hiatt | 1944 |

# Chapter 5

# The Golden Age of Mathematics

# 1945-1970

1. "The Mitchells and the U. G. Mitchell Honor Scholarships". A Talk by Dean Emeritus E. B. Stouffer, Delivered at a Meeting of the Department of Mathematics, October 16, 1956 [Records of the Department of Mathematics].

Ulysses Grant Mitchell achieved his distinctive name quite naturally, for he was born the same month that President Grant was elected to his second term. Growing to manhood in central Kansas, young Mitchell early acquired a great fondness for the State and its people, for its hills and its prairies, and its stirring history. Never has Kansas had a more loyal citizen or the University a more devoted member of its faculty. Those who knew him best recognized in Mitchell a rare human being, one to be admired, trusted and followed.

What were some of the qualities which made Mitchell what he was? Physically, he was no giant. But he could, and did, regularly stand up to long hours of effort. Six A.M. often found him at his desk. He carried a heavy teaching load and received far more than his share of committee assignments. Every worthwhile project in the community or in the University received his active support and frequently his leadership.

But Mitchell did not believe in all work and no play; he thoroughly enjoyed a game of skill, whether it be bridge or golf, or something between the two. I recall that, one or two summers before any of us had cars, he often walked to the Lawrence Country Club and back in order to play eighteen holes of golf on a hot summer day. I know this to be a fact for I usually went along.

Although not a giant physically, Mitchell came close to being one mentally. His remarkable memory and his wide reading made his mind a storehouse of information. He thoroughly enjoyed lively conversation, and even a good argument where his logical mind could get into action. He reached the master's degree level in history before shifting to mathematics. It followed naturally that he had a great interest in the history of mathematics. He acquired a respectable library in the field, which is now a part of our own mathematics library. One summer while in Europe he worked through many of the book stores of England and the Continent looking for books of historical interest to a mathematician. On two occasions he took leave of absence from the University to work in other libraries, once at Columbia University and once in Pasadena, California.

However, it was not the amount of work that Mitchell could turn out, or the keenness of his mind that made him so much loved by so many; it was the greatness of his heart. I never knew a man less self-centered or less concerned about honor and recognition for himself. The success of a friend gave him real pleasure and always brought speedy congratulations. He was quick to sympathize with any one in distress and ready to offer his assistance.

The welfare of University students was especially close to his heart. During the depression of the thirties many a student in financial difficulties came to him for help. If a grant, or a loan, or a job could not be found, the student often went away with a check on Mr. Mitchell's personal account.

These experiences and his work on scholarship committees made Mitchell recognize the great importance of scholarships and other grants for students in residence, but the need for these was only a part of the picture, as he saw it. He believed that something should be done to bring to the University as freshmen more of the talented and promising graduates of our high schools.

He knew full well that the more such students enrolled in the University, the easier it would be to maintain scholarship standards and even to raise them. Out of his thinking and discussions came the idea of what he chose to call Honor Scholarships. He was confident that the recognition of an Honor Scholarship would attract many capable high school graduates.

In the spring of 1940 Professor Mitchell had an opportunity to try out this idea. The income from the Donnelly bequest had become available; it was to be used entirely for scholarships. Professor Mitchell was appointed chairman of the committee to make recommendations on the nature of the scholarships and to select recipients for the next year. He had no difficulty in persuading the other members of the committee to recommend that a portion of the sum be used for Honor Scholarships for freshmen. About the same time he had a hand in persuading the Women's Self-Governing Association to endow an honor scholarship for women from funds acquired through the Book Exchange. The several Donnelly Honor Scholarships and the W.S.G.A. Honor Scholarship for Women have been continued to the present time in much the same manner as planned by Mr. Mitchell sixteen years ago. This is evidence enough that the idea was a good one.

In January, 1941, Professor Mitchell asked to be relieved of his position as Chairman of the Department of Mathematics. This afforded an opportunity for friends all over Kansas to show their respect and admiration for Mr. and Mrs. Mitchell. A dinner was held with every place occupied that could be crowded into the old Kansas room in the Student Union. It was truly a gala occasion.

The staff of the Department of Mathematics, several of whom had worked with Professor Mitchell for many years, desired to show some tangible evidence of their esteem for him. The customary gift of a silver tea service, or matched luggage, or an oil painting did not seem to fit the situation. Someone suggested that a fund be provided for an honor scholarship for the year 1941-42, named in his honor. In view of Professor Mitchell's great interest in such scholarships, this seemed the perfect gift. The expressions on the faces of Mr. and Mrs. Mitchell when announcement was made at the dinner of the U. G. Mitchell Honor Scholarship for 1941-42 gave evidence of their pleasure. How deeply they were moved will appear later. The U. G. Mitchell Honor Scholar for 1941-42 was a freshman with an excellent general academic record who gave evidence of high ability in mathematics.

Professor Mitchell passed away on January 1, 1942. The responsibility for carrying out the plans which he and Mrs. Mitchell had made together now fell upon Mrs. Mitchell. She possessed much the same greatness of heart, the same concern for others, and the same interest in student welfare. But above all else was her desire to establish a fitting and adequate memorial to her beloved husband. She did not talk much about it, but she indicated to a few friends that she was planning to leave the major portion of her property to the University with the income to be used for scholarships honoring Professor Mitchell. Although an invalid all the later years of her life, Mrs. Mitchell, in her eagerness to provide as large a fund as possible, went without many of the comforts to which she was entitled, and it sometimes seemed to her friends that she was depriving herself of some of the necessities of life.

Mrs. Mitchell passed away on Christmas Day, 1953. When her will was read it was found that she had left most of her estate to the Endowment Association. The only positive requirement in the will was that there be established at least one U. G. Mitchell Honor Scholarship similar to the one provided by the Mathematics Department for the year 1941-42. The will stipulated that any additional income be used to provide more scholarships, larger stipends, or certain items in connection with the Department of Mathematics. From earlier conversations with Mrs. Mitchell and from the tone of the will, it was evident that the scholarships honoring Professor Mitchell were her chief interest.

Every effort has been made to carry out Mrs. Mitchell's wishes. There have been established several U. G. Mitchell Honor Scholarships, mainly for freshmen, and a number of U. G. Mitchell Scholarships in Mathematics, principally for upperclass students. This year there are seventeen such honor scholars. They are with us this evening. To each of you scholars, I extend congratulations on the opportunities before you, and upon the recognition which has come to you in being selected as a U. G. Mitchell Honor Scholar. I hope that this brief talk has given you a greater appreciation of the fine qualities of Mr. and Mrs. Mitchell and a better understanding of what they had in mind in making provision for these scholarships.

2. "A Brief Account of the Early History of the Conference Board of the Mathematical Sciences[1]", by G. Baley Price; from the *Newsletter* of the Conference Board of the Mathematical Sciences, vol. 1 (1966), April, no. 1, pp. 1-3 [Price 27].

The American Mathematical Society and the Mathematical Association of America established their War Policy Committee[2] at the end of 1942 to assist them in dealing with a number of mathematical problems related to World War II. The War Policy Committee was supported by a grant from the Rockefeller Foundation, and Professor M. H. Stone was the Washington representative of the Committee. Through the War Policy Committee, the Society and the Association collaborated effectively on their common problems arising out of World War II. The War Policy Committee was discharged (November, 1945) after the war ended, but the American Mathematical Society immediately took the lead in the formation of the Mathematical Policy Committee, usually known simply as the Policy

Committee,[3] in order to provide an agency through which the mathematicians could continue their collaboration. The Policy Committee prospered, and eventually it had the following six member organizations: American Mathematical Society, Association for Symbolic Logic, Institute of Mathematical Statistics, Mathematical Association of America, National Council of Teachers of Mathematics, and Society for Industrial and Applied Mathematics.

In 1958 the Policy Committee was developed into the Conference Organization of the Mathematical Sciences, and a constitution and by-laws were drawn up. In December, 1958, the Mathematical Association of America received a grant of $75,000 from the Carnegie Corporation of New York for the establishment of a Washington office for mathematics. At its Salt Lake meeting in 1959 the Association recommended that the Washington office be established by the Conference Organization with the Carnegie grant. The Conference Organization accepted the responsibility for establishing the Washington office with the Carnegie grant, and on February 25, 1960, The Conference Organization was incorporated in the District of Columbia with the new name Conference Board of the Mathematical Sciences.[4] G. Baley Price, who as President of the MAA assisted in obtaining the Carnegie grant in 1958, was Chairman of the CBMS in 1960. He resigned as Chairman, was appointed the first Executive Secretary, and opened the office of the Conference Board in Washington on July 1, 1960.[5]

In the fall of 1960 the Conference Board of the Mathematical Sciences received a grant from Educational Facilities Laboratories to support its first project, a study of the design of buildings and facilities for mathematics.[6] Professor J. S. Frame was appointed project director, and he directed the study from the CBMS office in Washington during the year from July 1, 1961 to June 30, 1962. The project's report entitled *Buildings and Facilities for the*

*Mathematical Sciences* was published in 1963, and it is still much in demand by high schools, colleges, and universities.

On November 12-13, 1960 the Conference Board of the Mathematical Sciences held a conference on the support of higher education by the Federal Government.[7] A detailed report of the conference was published and widely distributed.

On April 16-17, 1963 the CBMS held a conference on manpower problems in the training of mathematicians.[8] The opening paragraph of the introduction of the report of this conference reads as follows:

"The conference, sponsored by the Conference Board of the Mathematical Sciences and supported by the National Science Foundation, was the response of the mathematical community in the United States to the report of the President's Science Advisory Committee (PSAC) on *Graduate Training in Engineering, Mathematics, and Physical Sciences* issued at the White House on 12 December, 1962. Participants in the conference represented the constituent organizations of CBMS, government agencies, the National Research Council, national organizations of engineers and physical scientists, and public and private foundations."

Professor S. S. Wilks was elected Chairman of the CBMS when G. Baley Price became Executive Secretary on July 1, 1960. Professor A. W. Tucker was Chairman in 1961-1962, Professor J. Barkley Rosser was Chairman in 1963-1964, and Professor R. H. Bing has been Chairman since the beginning of 1965. Professor Leon W. Cohen became Executive Secretary in the fall of 1962 and served until the end of the summer of 1965. Dr. Thomas L. Saaty became Executive Director of CBMS in the fall of 1965. Dr. John R. Mayor has served as the Secretary of the Conference Board since 1960 and also as its Treasurer since 1961.

The Association for Computing Machinery became the seventh member of the Conference Board of the Mathematical Sciences in 1962.

## Notes

1. See also Notices of the American Mathematical Society, vol. 7 (1960), pp. 576-577.

2. References to the War Policy Committee and its activities are found in the following reports: *American Mathematical Monthly*, Vol. 50 (1943), pp. 138, 205, 466, 593; Vol. 51 (1944), pp. 112-115, 549; Vol. 52 (1945), p. 115. *Bulletin of the American Mathematical Society*, Vol. 49 (1943), p. 199.

3. The first reference to the formation of the Policy Committee occurs in the report of "The Twenty-Ninth Annual Meeting of the Association," *American Mathematical Monthly*, Vol. 53 (1946), p. 178.

4. An account of the incorporation of the CBMS can be found in *Notices of the American Mathematical Society*, Vol. 7 (1960), pp. 303-304. The CBMS was incorporated on February 25, 1960 rather than on the date stated in this report.

5. The first office of the CBMS was located in the building of the American Association for the Advancement of Science at 1515 Massachusetts Avenue, N. W. On July 1, 1961 the office was moved to the Mills Building at 17th Street and Pennsylvania Avenue, N. W., and on April 1, 1964 it was moved to the Dupont Circle Building at 1346 Connecticut Avenue, N. W.

6. An announcement of this project is given in the *Notices of the American Mathematical Society*, Vol. 7 (1960), pp. 680-681.

7. A brief account of the conference can be found in the *Notices of the American Mathematical Society*, Vol. 7 (1960), pp. 809-810.

8. The proceedings of this conference were issued as *Conference on Manpower Problems in the Training of Mathematicians: Report*. Conference Board of the Mathematical Sciences, Washington, D. C. 13 July 1963. 162 pp.

## 3. Department of Mathematics Staff, 1945-1970.

The Department's staff, during the period 1945-1970 covered by chapter 5, was made up of the following categories:

(a) a chairman;

(b) instructors, assistant professors, associate professors, professors, and a Summerfield Distinguished Professor;

(c) lecturers, research associates, and visiting professors of the various ranks;

(d) assistant instructors and research assistants; and

(e) secretaries.

Those in categories (a), (b), and (c) were known as the senior staff of the Department; those in category (d) constituted the junior staff.

The list below contains the names of all of those who were members of the senior staff at any time between 1945 and 1970. It is as complete as it was possible to make it in 1972; but complete accuracy, especially with respect to instructors and short-term visitors, cannot be guaranteed. The dates given indicate the periods when those named held appointments as active members of the senior staff. A few of those listed were members of the Department's junior staff during additional periods.

The assistant instructors taught half-time, and nearly all of them were graduate students in mathematics; a few, however, were graduate students in engineering, business, or mathematics education. In the early years, the names of assistant instructors were listed in the University catalogs, but the 1956-1957 catalog is the last one that lists the assistant instructors in mathematics. Since their number was large (the Department's staff contained as many as seventy-two half-time assistant instructors at its peak size), and since the group changed from semester to semester, a complete and accurate list of the Department's assistant instructors would be very long and very difficult to assemble.

| | |
|---|---|
| Herbert Edwin Jordan | 1911-1948 |
| John Jefferson Wheeler | 1911-1947 |
| Ellis Bagley Stouffer | 1914-1955 |
| Florence Lucile Black | 1918-1960 |
| Wealthea (Wealthy) Consuelo Babcock | 1920-1966 |
| Guy Watson Smith | 1920-1956 |

| | |
|---|---|
| Winona Venard | 1930-1934, 1942-1946 |
| Gilbert Ulmer | 1931-1934, 1939-1974 |
| Philip Osborne Bell | 1936-1955 |
| Griffith Baley Price | 1937-1975 |
| Edison Greer | 1938-1940, 1945-1946 |
| William Calvin Foreman | 1940-1941, 1946-1948 |
| Minnie Robertson | 1942-1947 |
| Martha Elizabeth Peterson | 1942-1952 |
| Marvin E. Rolfs | 1943-1947 |
| Lucy Daugherty | 1943-1947 |
| Robert Schatten | 1946-1961 |
| Loren Akers | 1946-1947 |
| Lena Hadley | 1946-1947 |
| Norma Hardman | 1946-1947 |
| Howard Mason | 1946-1947 |
| Otho Rasmussen | 1946-1952 |
| Bertha Cummins | 1947-1949 |
| Kathleen O'Donnell | 1947-1962 |
| Alice Swenson | 1947-1950 |
| Israel Nathan Herstein | 1948-1950 |
| Robert Marceau | 1948-1950 |
| Gordon Overholtzer | 1948-1949 |
| Minnie Stewart | 1948-1951 |
| Sarvadaman Chowla | 1949-1952 |
| William Raymond Scott | 1949-1965 |
| Vidar Michael Wolontis | 1949-1953 |
| John W. Forman | 1949-1951, 1953-1954 |
| John Nipps | 1949-1950 |
| Margaret Pihlblad | 1949-1951 |
| Frances Lee (Wolfe) Lillo | 1949-1951, 1956-1959 |
| Nachman Aronszajn | 1951- |
| Ainsley H. Diamond | 1951-1952 |
| Arthur Norton Milgram | 1951-1952 |
| S. S. Shrikhande | 1951-1953 |
| Warren Keith Moore | 1951-1952 |
| Arthur Joel Zeichner | 1951-1952 |
| John LeRoy Kelley | 1952-1953 |
| William F. Donoghue, Jr. | 1952-1962 |
| Kennan Taylor Smith | 1952-1959 |
| George B. Pedrick | 1952-1954, 1955-1957 |

| | |
|---|---|
| Sydney Henry Gould | 1953-1954 |
| Alan K. Jennings | 1953-1954 |
| Arne Magnus | 1953-1954 |
| J. T. McNamara | 1953-1954 |
| Gustave Choquet | 1953 (fall semester) |
| Russell Newton Bradt | February 1954- |
| Marcel E. Brelot | 1954 (spring semester) |
| | |
| Arthur Herman Kruse | 1954-1960 |
| Dale Maness | 1954-1955 |
| Lucille Parks | 1954-1956 |
| David A. Rux | 1954-1955 |
| Peter W. Zehna | 1954-1956 |
| Alexander Grothendieck | 1955 (spring semester) |
| | |
| George Springer | 1955-1964 |
| Elliott Ward Cheney | 1955-1956 |
| William E. Hartnett | 1955-1956 |
| Kitty Jehle | 1955-1957 |
| Rosetta Pedecini | 1955-1956 |
| Meredith Sperline | 1955-1956 |
| Yudell L. Luke | 1955-1957 |
| | |
| Donald R. Truax | 1956-1959 |
| Elbert Abner Walker | 1956-1957 |
| Avner Friedman | 1956-1957 |
| | |
| Urs W. Hochstrasser | 1957-1958 |
| Frank Gamblen | 1957 (fall semester) |
| James C. Lillo | 1957-1960 |
| Selmo Tauber | 1957-1959 |
| | |
| Jacob Christoph Edmond Dekker | 1958-1959 |
| John Beverley Johnston | 1958-1964 |
| Lee Meyers Sonneborn | 1958-1967 |
| | |
| Charles John Himmelberg III | 1959- |
| Wendy Jean Robertson | 1959-1960 |
| Shirley Temple (Loeven) Deeter | 1959-1960 |
| Alexander P. Robertson | 1959-1960 |
| | |
| Swarupchand Mohanlal Shah | 1960-1966 |
| Robert D. Adams | 1960- |
| William Charles Nemitz | 1960-1961 |
| Carol Hoffer Bassett | 1960-1964 |
| Andrew Page | 1960-1961 |
| | |
| Paul Joseph McCarthy | 1961- |
| Richard G. Hetherington | 1961- |
| Pawel Szeptycki | 1961- |
| Emilio Gagliardo | 1961-1963 |

| | |
|---|---|
| Fred Scott Van Vleck | 1962- |
| John Thomas White | 1962-1965 |
| Peter Wilker | 1962-1963 |
| Margaret Lester | 1962-1963 |
| Eduardo Zarantonello | 1963 (spring semester) |
| | |
| Robert Dillon Brown | 1963- |
| Günther W. Goes | 1963-1964 |
| Martin Slafter Hanna | 1963- |
| John H. Harris | 1963-1966 |
| Joe Leonard Mott | 1963-1965 |
| John Andrew Pfaltzgraff | 1963-1965 |
| Haruo Murakami | 1963-1965 |
| Arne Persson | 1963-1964 |
| Ivan L. Rose | 1963-1964 |
| | |
| James L. Griffith | 1964-1965 |
| E. Benton Cobb | 1964- |
| Philip R. Montgomery | 1964- |
| Thomas M. Creese | 1964- |
| Karin Vantuyl Chess | 1964-1965, 1968-1969 |
| Ponnaluri Suryanarayana | 1964-1965 |
| | |
| Jayanthi Chidambaraswamy | 1965-1966 |
| Patricia Ruth (Swope) Croat | 1965-1967 |
| Rolf L. M. Anderson | 1965-1966 |
| Charles Ehresmann | 1966 (spring semester) |
| | |
| Thomas K. Boehme | 1966-1967 |
| Robert R. Colby | 1966-1969 |
| Edgar A. Rutter, Jr. | 1966- |
| Mark Mandelker | 1966-1969 |
| Richard E. Phillips | 1966-1969 |
| Manfred Breuer | 1966-1971 |
| Ronald Jacobowitz | 1966-1970 |
| Jack R. Porter | 1966- |
| Robert E. Powell | 1966-1969 |
| Milton Rosenberg | 1966-December 1970 |
| Carl Benjamin Boyer | 1966 (fall semester) |
| | |
| Robert D. Moyer | 1967- |
| James D. Church | 1967- |
| Theodore W. Palmer | 1967-1970 |
| Leonard J. Lipkin | 1967-1972 |
| | |
| James F. McClendon | 1968- |
| T. P. Srinivasan | 1968- (on leave, 1969 to January 1972) |

| | |
|---|---|
| Frank D. Anger | 1969-1970, 1971-1972 |
| Robert S. Cunningham | 1969-1973 |
| James M. Hornell | 1969-1973 |
| Thomas G. Kabele | 1969-1972 |
| Donald L. Stancl | 1969-1972 |
| Mildred L. Stancl | 1969-1972 |
| James W. Brewer | 1970- |
| John W. Bunce | 1970- |
| Paul F. Conrad | 1970- |
| James A. Deddens | 1970- |
| Paul S. Mostert | 1970- |

4. Names of those who received Master of Arts degrees, by academic years, from the Department of Mathematics, 1945-1970.

1947-1948

Howard Hayden Barnett
Vernon E. Benson
Joseph Carlson
Samuel George Kneale
Warren Keith Moore
Kenneth Neal Nickel
James D. Riley

1948-1949

Joseph Ross Brown
Norman C. Hoover
H. Melvin Lieberstein
Hugo Quentin Rolfs
Arnold Marion Wedel
Frances Lee Wolfe

1949-1950

Lolafaye Coyne
Robert Charles Fisher
Sidney Marshall Foulks
Geraldine V. Jones
James Richard Larkin
Margaret Marie Pihlblad
Martha Cable Wagner
Mary Gertrude Welch

1950-1951

Russell Newton Bradt
Robert Edwin Heaton
Arthur Herman Kruse
Alan B. Showalter
Robert Harry Thompson

1951-1952

Delmar L. Boyer
Dorothy Jane Boyer
Kenneth Eugene Lake

1952-1953

Isaac (Isaku) Namioka
Dorothe Hazel Schuepbach
Joe Forrest Wampler

1953-1954

Kenneth Stanley Gale
Mehdi Shirazi

1954-1955

Arthur Richard Brown
Charles Cyprian Chouteau
George Ladner
Allen Jules Silverman

1955-1956

Francis Andrew Imaikalani Bowers
Hector Correa
Samir A. Khabbaz
John August Nelson

1956-1957

John McCormick Irwin
Paul W. Liebnitz, Jr.
Harry Lewis Nelson
Galen Lathrop Seever
Robert M. Woodruff
Peter William Zehna

1957-1958

Loren Neil Argabright
Daniel George Dewey
K. Leon Montgomery
Emma Joan Nance
Mary Jane Secrest

1958-1959

John David Couch
Shirley Loeven Deeter
Willis Howard Dukelow
Harold Bob Hanes
Neal M. Kendall
Shoichiro Kobayashi
Gerald Lawrence Lane
David Brooks Lehmann
William Maxwell Lindstrom
Joseph Harold McBeth
Greta Mack
Charles A. Marsh
DeWayne Stanley Nymann
Dwight Patton, Jr.
Donald Bridgham Small
Masanobu Yonaha

1959-1960

Terrence Brown
Stuart Lee Bunday
Charles Orlyn Christenson
Donald Bruce Erwin
Peter R. Flusser
Charles Bernard Frye, Jr.
Wilfred Martin Greenlee
Buddy Ava Johns, Jr.
Elaine LaValle Johnson
Thomas P. Kezlan
David Walker Lane
William David McIntosh
Guy Kenneth Magnuson
Peter Clyde Patton
Wilma Irene Roberman
Harley Ray Stafford
Ellen Carolyn Veed

1960-1961

John Paul Beaulieu
Clair Joe Becker
Leslie A. Berry
Gary Lynn Blancett
Donavan Emil Cassatt
Vaden Gene Child
William Theodore Covert
Robert Hilderley DeVinney
James Stanley Dombek
Khalid Ahmed El-Samarrai
James Richard Ewbank
William John Helm
Donald B. Johnson
Virginia M. Johnson
Maassouma Mohamed Kazin
Lucille Mabel Parks
A. Allan Richert
Frank Stewart Rogers
Marvin Eugene Turner
William Benjamin Wallace

1961-1962

Richard Craig Basinger
Barbara Blake Bath
Player E. Cook
Robert Abbott Estes
Eugene Roy Grassler
David Thomas Graves
Alfred Gray
Robert Lewton Gray
Troy Lee Hicks
John Robert Hilbert, S. J.
J. Peter Johnson
Boo-Sang Lee
Charles R. Nicolaysen
Richard Edward Phillips, Jr.
Kent David Richert
Howard Lawrence Taylor
Mary Lee Wheat
John Wesley White
Charles W. S. Ziegenfus

1962-1963

Martha Lentz Anderson
O. Lexton Buchanan, Jr.
Edwin Williard Buchert
Thomas Joseph Fitzgerald
George C. Gastl
Larry Francis Heath
John Jenkins Ivery
Sandra Sue Janousek
Albert F. Joseph
Loren Charles Larson
David Griffiths Lash
Phillip Reed Long
Donald Arthur Morris
Derald David Rothmann
Harold Federico Schick
Erwin August Schroeder
Sara Ann Yeagley Simcoe
Myrna C. Sorensen
Darrel Ray Thoman
Tara Vedanthan
Janice Ann Wenger
Fred Allen Womack, Jr.

1963-1964

Richard Alan Bell
Stephen Joseph Bozich
Emanuel G. Calys
Nancy S. Curtis
Joseph Embley Emonds
Peck Heng Lam
Martin Traugott Lang
Max Dean Larsen
Rollin Quinn
Charles Sparks Rees
Joyce Adrian Shana'a
Louis Hearn Whitehair

1964-1965

Duane E. Anderson
Richard Lee Barlow
Joan Adelle Carlson
Karin Van Tuyl Chess
Charles Roy Combrink
David Edward Fischer
Sigrun Marieluise Goes
John Robert Golden
Dorothy J. Hain
Robert L. Johnson
Kenneth Gerald Klenke
Dean W. Lawrence
Edward William Munster
William A. Nickel
Lawrence George Page
Elbert M. Pirtle
Robert Harry Plummer
Joan Prott
Dieter Armin Reetz
Shirley Evelyn Scott
Ronald Lee Shubert
Meredith Rapprich Speers
Richard Lee Speers
James D. Spencer
Donald F. St. Mary
Phyllis Lukehart Walker
John Wesley Wyman

1965-1966

Mildred Gladys Andes
Gene William Arnold
John M. Baker
Glenn Richard Calkins
Robert Michael Cantor
William Rowland Edwards
Paul Jon Eenigenburg
Keith Arends Ekblaw
Ronald Dean Halbgewachs
John Richard Hedstrom
Stanley Klein Kranzler
Harold Warren Mick
Jonathan B. Mosley
John Arthur Mura
Christopher Edwin Olson
Richard Gordon Prince
Richard Stanley Rempel
Lary Schiefelbusch
Dennis H. Schnack
Arlo W. Schurle
Thomas Stephen Shores
Said Najati Sidki
Patricia R. Swope
John Albert Wenzel
Michael J. Wiedel
Donald J. Wright
Michael J. Wright

## 1966-1967

Richard G. Albers
Larry E. Beirich
Don King Blevins
Dale K. Burtner, Jr.
Norman Frederick Chaffee
Jerald Paul Dauer
Ronald E. Dean
Robert Francis Doser
Stefan Feyock
Lloyd Alvin Gavin
Ned Maurice Gibbons
James R. Hers, Jr.
John J. Hutchinson
Richard Charles Janzig
Robert Charles Knapp
Alan H. Kvanli
Ronald James Lyons
J. Robert Morton
Deborah E. Prince
Willard William Remmers
Richard J. Shumway
Adelbert Odle Smith
William Albert Subick
Carol Ann Targett
Tommy Kay Teague
Teressa Miltich Uhlrich

## 1967-1968

Larry Allan Anderson
Larry D. Blumberg
Dennis Alan Bonnett
John William Boushka
David Eugene Brown
Wing-Sang Chan
Jose Jesus Chaparro
Marvin Erwin Donaldson
Felix F. Dreher
James William Frane
John Douglas Harris
Harriet E. Hayes
Dennis Gregory King
Judith Louise Magnuson
Stephen Fred Markstein
Cheryl Catherine Ooten
Robert Jordan Sanders
Carlos Benigo Segami
James Roymond Tell

## 1968-1969

Paul Franz Albert
Judith Ann Anderson
Joseph A. Bergin
Ronald Rea Brown
James Coleman Deel
Wellington Clark Engel
Don H. Faust
Dorothy A. Fitsgerald
Joseph Anthony Gallian
Harvey S. Gunderson
Robert A. Herman
Donald E. Kruse
Gerald J. LaCava
James Charles Lewis
Patrick Thomas Malone
Thomas E. Olsson
Timothy J. Reed
Robert J. Rojakovick
Arthur D. Snow, Jr.
Richard Eric Sweet
David J. Thuente
David F. Wooten

1969-1970

Gerd H. Fricke
Richard D. Cruise
Sheldon Adelberg
George F. Mazaitis
Martha L. Harmonson
William M. Scruggs
Arthur D. Grissinger
Maurice D. McClenahan
Lewis J. Williams
Lester M. Bartley
Julia T. Wharton
Charles R. Bernet
Joseph J. Perfetti
Joanne Pieczynski
Cheng Hsun Chi

5. Names of those who received Doctor of Philosophy degrees, by academic years, from the Department of Mathematics, 1945-1970.

1946-1947

Edison Greer

1950-1951

Warren Keith Moore

1951-1952

William Calvin Foreman
James Richard Larkin
James Daniel Riley

1952-1953

Robert Charles Fisher
Kuo-Chih Hsu

1953-1954

Alan Kellerman Jennings

1954-1955

Ralph Boyett Crouch
Bobby J. Hollingsworth
Prom Panitchpakdi

1955-1956

Delmar L. Boyer
Calvin Virgil Holmes
Eugene Kay McLachlan
Elbert A. Walker

1956-1957

Elliott Ward Cheney, Jr.
Kenneth Robert Lucas

1957-1958

William Edward Hartnett
George A. Ladner
George B. Pedrick

1959-1960

John McCormick Irwin
Samir A. Khabbaz

1960-1961

Russell Gene Bilyeu
Edward D. Gaughan

1961-1962

Thomas James Head
Masanobu Yonaha

1962-1963

Charles Raymond Deeter
Fuad Shakir Mulla
Charles James Stuth

1963-1964

John Riley Durbin
Eberhard G. P. Gerlach
Thomas P. Kezlan

1964-1965

Richard Craig Basinger
Buddy Ava Johns, Jr.
Paul W. Liebnitz, Jr.
William David McIntosh
DeWayne Stanley Nymann
Raymond Elmer Pippert
Ted J. Suffridge
Mary Lee Wheat (Gray)

1965-1966

Terrence Joseph Brown
William McLain Causey
Larry Francis Heath
Richard E. Phillips

1966-1967

Charles Roy Combrink
Roger Thackrey Douglass
Harold Bob Hanes, Jr.
Max Dean Larsen
Charles Sparks Rees
Arlo Willard Schurle
Said Najati Sidki
David Eugene Wilson

1967-1968

Wilfred Martin Greenlee
John Joseph Hutchinson
Robert LeRoy Johnson
William Dale Maness
Elbert M. Pirtle
Thomas Stephen Shores

1968-1969

Charles Compton Alexander
Karin Van Tuyl Chess
Wyman Glen Fair
John Douglas Harris
David Elmer Kullman
Loren Charles Larson
Michael Jerome O'Neill
Richard Lee Speers
Howard Lawrence Taylor
John Albert Wenzel

1969-1970

Deborah E. Prince
Michael J. Wright

# Chapter 6

# The Library

# 1866-1970

## 1. Librarian's Report to the Board of Regents, 1885, by Ephraim Miller.

I have the honor to present the biennial report of the Librarian. Previous reports of the condition of the library have been confessions of weakness and needs, rather than robust vigor. Twelve years ago, when by appointment of the Board I assumed control, there were 1,700 volumes in the library. Increasing at the average rate of 500 per year, the number has now become 7,700. This slow but steady accumulation, the growing demand by professors and students for better library facilities, and the knowledge that there is a way of using books so as to involve a minimum expenditure of time and labor, developed the necessity of indexing and classifying the library. One year ago, Mr. A. W. Tyler, a gentleman of wide experience and practical knowledge of all the details of bibliography, was employed three months to initiate the new order of things. Two months of my summer vacation were also spent by myself among the books, and during the year 1885-6, Mr. H. F. Graham, a member of the Senior class, was employed two hours per day, carrying forward the same work.

At the present writing, all the books on biography, English literature, fiction, German history, philosophy, political science, and theology, aggregating over 3,000 volumes, are indexed and classified according to the system now in use in Columbia College. I have made a special effort to secure a complete set of the Congressional Record and its predecessors, as far back as to the beginning of the Continental Congress, and the result is as follows:

| | | |
|---|---|---|
| 1. | *Journals of Congress*, Sept. 1774 - Nov. 1788 | 13 vols. |
| 2. | *Debates and Proceedings in the Congress of the U. S.*, 1789-1824 | 42 vols. |
| 3. | *Register of Debates in Congress*, 1824-1837 | 29 vols. |
| 4. | *Congressional Globe* | 109 vols. |
| 5. | *Congressional Record* | 64 vols. |

This list brings the work down to the second session of the Forty-eighth Congress, the volumes of which are not yet bound.

During the past year there have been added by purchase, 81 volumes in English literature, 23 in natural history, 64 in political science, 11 in engineering, 11 in German and French, 18 in physics and astronomy, 13 in philosophy, 13 in chemistry, 46 in music, 12 in mathematics, 11 in Greek, and 11 in Latin--making a total of 305 volumes purchased.

Donations were received from the following sources

| | |
|---|---|
| Miss Ethel B. Allen, Kansas City, Mo. | 38 vols. |
| Prof. Bailey | 2 vols. |
| Rev. J. S. Brown, Lawrence | 6 vols. |
| Prof. Carruth | 1 vol. |
| Mrs. D. C. Haskell | 13 vols. |
| Chancellor Lippincott | 1 vol. |
| Hon. Charles Robinson, Lawrence | 1 vol. |
| Hon. Ed. Russell, Lawrence | 3 vols. |
| Smithsonian Institution, Washington, D. C. | 11 vols. |
| Prof. L. W. Spring | 1 vol. |
| U. S. Board of Health | 3 vols. |
| U. S. publications | 67 vols. |
| Miscellaneous | 148 vols. |
| Total | 295 vols. |

In my last report I recommended that three thousand dollars a year be appropriated for the purchase of books. That recommendation is herewith repeated, and in justice to the needs of the various departments the sums should be distributed as follows:

| | | | |
|---|---|---|---|
| Chemistry | $150 | Latin | 250 |
| Current Literature | 150 | Mathematics | 150 |
| Engineering | 150 | Natural History | 200 |
| English Literature | 300 | Philosophy | 300 |
| German and French | 300 | Physics and Astronomy | 150 |
| Greek | 300 | Scientific and philological periodicals | 200 |
| History and Political Science | 300 | Miscellaneous | 100 |

Is that sum too much? The question should rather be, Why is it so little? What is a university without a library? Or, of what use is a library when it does not contain *some* of the books that are needed every day? I hope this matter may be pressed to a successful issue.

It is a matter of supreme moment to the University and its friends, that the library, small as it is, be in the best possible condition for use. In its present quarters it is crowded for lack of room. The books are overflowing the shelf-space, the window-sills are stacked with them, and the floor-space is consumed by the chairs, tables and newspaper racks of a reading and study room for students. Before another year, the difficulties that are now unavoidable should be out of the way.

And now, gentlemen, I desire to call your attention to a subject that must be met sooner or later. A library building is needed even now, and the necessary steps should be taken at once, so that when the time shall have come, there will be no delay in the erection of a suitable structure. The building should be of at least 100,000 volumes capacity, furnished with facilities for classification, service, compactness of storage, and distribution of light and heat, and thoroughly ventilated. There must be ample space for the administration of the library, affording to the officials convenient access to all rooms, facilitating the delivery and return of books, and furnishing complete control and oversight of the entire area of every portion of the building.

There should be two separate systems of vestibules, cloak rooms, corridors, and staircases, the one for male and the other for female students, giving access to all parts of the building that are for their accommodation and use.

A large reading room appropriately furnished, lecture rooms, and rooms for special students, and unpacking and storage rooms are also among the equipments of such a building. Too great attention cannot be given, nor too soon, to a subject that is of the highest importance to the best interests of the University.

"The library of the University is the foundation of its intellectual power. Here we all come, day by day, students and teachers, to kindle our feeble tapers afresh by the inextinguishable lamps with which the great scholars and thinkers of all time have illumined the world. Here in our quiet library halls the revered masters of science, and philosophy, and song, condescend to sit with us as guides, inspirers, and friends."

Appendix I

"Ephraim Miller's Recollections"

Published in the *Lawrence Daily Journal-World*, May 25-27, 1925

"Ephraim Miller's Recollections"

(The following paper was read by Prof. Ephraim Miller at the banquet given by the K. U. Alumni association at the Baltimore hotel in Los Angeles, Cal., in honor of Professor Miller's ninety-second birthday anniversary:)

Near the town of Carrollton, O., there was born in a log cabin, on the 25th of April, 1833, a boy baby to whom was given the name of Ephraim. Before the boy was 5 years old, he went to school, where he took the first steps in the acquisition of knowledge. He began with learning to spell, to read and to write. After these came arithmetic, grammar and geography, and these were followed by courses in Latin, Greek, algebra, geometry and natural philosophy. He remembers that it was very easy to learn his lessons, so easy that his teacher thought the boy had plenty of time to learn two lessons in geography every day, in addition to his regular work. But the boy could do just so much and no more. So he failed in the extra task imposed, and the teacher inflicted a severe punishment upon him, which the boy remembers to this day.

The schoolhouses of that day and in that part of the country were built mostly of logs, and their furniture consisted of long board slabs for seats, and for writing desks boards held in place by wooden pins driven into the logs of the house.

Ephraim went to school on foot, there being no autos, no airplanes, and no street cars. In fact there were no telegraphs, no telephones, no railways nor radios in those primitive days. His athletics consisted of a walk of four miles to and from school. As a consequence the boy was hale, hearty and strong in mind and body. When twelve years old, he attended an academy in Carrollton. One of his classmates was Alexander McCook, a member of the famous fighting McCook family, of the Civil War times. Alec, as he was called, lived not far from the academy, and every morning had Ephraim stop at his house, in order to assist Alex with his algebra, and other lessons. Alex became a major general in the U. S. Army.

Those were great days for the boys. Ephraim remembers once running a race with another boy, through a layer of snow over twelve inches deep on the level. The boys pulled off their shoes and stockings, rolled up their trouser legs above the knees, and then started. They ran a half mile each way. After the race, the boys rubbed their legs until they were red hot. It was a glorious race and the boys had the time of their lives.

After two years at the Academy Ephraim, not 15 years old, taught school in a log house which was not over 15 feet square. His pupils were an aunt or two, an uncle, his cousins, and two or three young men. For this service he received five dollars. About this time a neighbor told the boy's father, that he owned a one hundred dollar scholarship in Allegheny College, and that if Ephraim wanted to go to college, he was welcome to use the scholarship for the whole four year course. The offer was gladly accepted and preparation was made at once to send the boy to Allegheny. It was a great day for Ephraim when he started to attend college. His relatives, assembled to see him off, and among them were three aunts. All were excited and wondered what manner of man the boy would become after graduation. One aunt said he will be a preacher, a second said he will be a lawyer, and the third firmly believed that Ephraim was cut out to be a doctor. But the boy looking the matter in the face as well as he could, said in substance, "there is nothing doing."

With thirty-five dollars in his pocket, including the five received for the four months of teaching, Ephraim started in an old stage coach drawn by four horses, for Allegheny. At Steubenville on the Ohio River, he took passage on a steamboat for Pittsburg, Pa., and from that city to Meadville, the seat of Allegheny.

The boy's mother had made for him a suit of clothes, of good material, but of wonderful style and color. She had also packed his trunk with his clothes, books and some sweet bread to appease his hunger on the road. Often the memory of love of that good woman is present in the mind of her son.

The first morning at Allegheny was a memorable one. Work began by attending chapel exercises. All the student body had to attend. A chapter from the Bible was read, prayer was offered, and various announcements were made. The educational ship was launched, and the entire faculty, consisting of six or seven men, occupied the platform. The students sat upon long seats made out of pine boards. Ephraim did as he saw others doing, and having presented his credentials, was entered at his own request as a senior preparatory student, although his credits were such as to have given him standing in the second half of the freshman year. Just imagine a gawky, green boy, not quite fifteen years old, perfectly ignorant of college life and manners, standing there before the august body, the faculty, awaiting his doom, with fear and trembling. For nearly a month he had terrible spells of homesickness and had any one told him to pack his trunk and go home, he would certainly have done it. However, one morning just as chapel exercises began, Ephraim saw a young man enter, whose face looked very familiar. This young man was an old friend of his. Strange as it may seem, that dreadful homesickness was gone, and never more was Ephraim afflicted with it.

His studies were rhetoris, algebra, Latin and Greek. A thorough training in the old classic languages, under splendid tutors, fitted him to enter a class in Cicero's Orations, and another in Xenophon's Anabasis and Cyropedia.

Many of the students boarded themselves. They rented rooms partly furnished, hired some woman to do their laundry work and bake their bread, but they did their own cooking. Some of them became experts in preparing meat for the table, and making flap-jacks, so-called, and various other tit-bits. Each member of a club was to exercise his culinary talents in the kitchen, a week at a time, and then another member assumed the responsibility. The cook as a rule, not only had to cook, but had to purchase supplies for the week. Besides this he had to deliver the goods purchased. Ephraim remembers having gone down town to lay in supplies for his week. Among the articles bought was a sack of potatoes. Not wishing to be seen, he naturally made his trip back to his room after dark, with the sack of potatoes on his back. A new house was being built close by and to get rid of the shavings the workmen had carried them out to the middle of the street. Ephraim was getting along fine, but just behind him was a carriage load of gentlemen and ladies going up the hill. Just then some one lit the shavings and instantly a bright light illuminated the surroundings. A classmate of the man with the sack of potatoes, Pickett by name, a mischief of the first water, was standing in the doorway of the rooming house, at a glance took in the situation. He shouted in a loud voice, "Miller, what did you pay for potatoes?"

At the end of the first term, Ephraim's money was nearly all gone. He and three or four other students went to New York State to work in the harvest fields, and incidentally fill their fingers full of Canada thistles. No one can depict fully the exquisite pain those thistles can produce. In addition to the binding of bundles of wheat, the boys were required to milk the cows in the mornings and evenings. Miller had never been trained in the high art of milking cows, and of course had never learned its fine points. In fact he did not know how to do it, his hands could not handle the subject. One of the other boys, however, had learned the art to perfection and knew how to extract the lacteal fluid without difficulty. He kindly relieved his friend in his trouble. After harvest time had ended, the boys returned by way of Niagara Falls to

College, where in due course of time the term ended.

During the ensuing winter, Miller taught school not many miles from the College. He received $10 per month, boarded a week at a time at the homes of the patrons, teaching 26 days to the month. Thus another term at the College was provided for. Ocassionally a Professor was absent from his classes. The professor of Greek was sometimes away on College business or delivering lectures. Miller was appointed to take charge of his classes, and of course felt very highly honored. Still he had to work hard to secure high grades. He studied his lessons in the afternoon, and after retiring to bed, would review in his mind every lesson before falling asleep. This became a habit. He remembers that at the beginning of one term, he had to translate two hundred lines of Tacitus, two hundred lines of Greek tragedy, and solve thirty-two problems in differential calculus. He began on the Calculus at 1 o'clock, and at 10 p. m. finished the last problem. One hour, however, was spent in physical exercises and eating supper. Then he tackeled his Tacitus, and the Greek Tragedy of Sophocles. It was then one o'clock a.m. He went to bed, and as his custom was, went over every lesson mentally before falling asleep.

At the close of the second year, Miller's financial affairs had reached a very low state. To meet this condition, he had to resort to teaching and at times working at anything he could do, chopping wood, farming, and other jobs. His wages at teaching range from 14 to 20 dollars a month. A dollar in those days was worth exactly one dollar. Living was cheap, clothes were cheap. A good suit of clothes could be purchased for $20. Walking was dirt cheap. After a period of three years Miller's finances were improved, and his father was an invalid afflicted with spinal trouble and very poor, so eighty dollars were given him.

Miller passed his Junior year at College, 1852-53, in fine shape. At the close of that year, the wolf was again at hand, and no money in sight, notwithstanding the accumulations of the previous three years. Without money, it was of no use to think of his Senior year. Miller's roommate had a brother in New Orleans, a principal of a ward school, and a vacancy in one of the schools had to be filled. The principal, Kline by name, wrote his brother at Allegheny, to go at once to the southern city and secure the position. The brother wishing to graduate as soon as possible handed the letter to Miller, urging the latter to go in his stead. With letters from the brother and the President of the College, Miller was soon on his way to the southern city. On his arrival there, he looked up principal Kline, who informed him that an examination for the vacancy was already under way. Just here it may be stated, two fellow students accompanied Miller, one of whom had to borrow money to enable him to go south. Miller went his security. The three northerners at once became applicants for the vacant position. On Friday evening Principal Kline informed Miller that the Superintendent desired to see him on Saturday morning. The result was that Miller was selected to fill the vacancy, and work was to begin on the following Monday morning, at a salary of $840 a year. That salary looked almost like a million to the young man. The next week, one of the other two fellows secured a position in another ward. The third went up the Red River and secured a six months' job as teacher in a wealthy planter's family, at a salary of $50 a month. A darkey to wait on him, a pony, a gun, fishing tackle, and all the et ceteras that a rich southern gentleman could furnish, were at his command. His duties were to instruct the planter's three children three hours every day. The school houses of New Orleans of that day were so arranged that the girls were in a room by themselves, and the boys in other rooms by themselves. The school buildings had broad verandas or porches on all four sides.

The principal of Miller's school, lost his wife shortly after the schools were opened. Miller was placed temporarily in charge of the principal's room. If a man's patience and soul were ever put to the test this northerner had such an experience. The teacher, however, was victorious, and at the end of the two weeks, returned to his own room.

In the first ward a teacher, a graduate of Williams college named Carter, a splendid fellow, and a rigid disciplinarian, who had a very unruly boy, the son of a sea captain. Carter one day punished the boy very severely, which only made the boy worse. The next morning, the boy's father and another man called to see Carter. The latter met them at the door, and at once the irate father told his errand. He did not allow any one to abuse his boy as Carter had done, and using a loaded cane that he had in his hand, he struck the teacher on the head stunning him for a moment. Carter, being a very athletic man, soon recovered, and jumping on the sea captain, threw him to the floor, but the seaman being a very strong man turned Carter over, beat his face into a jelly, and then departed. When the teacher was fully recovered, he was transferred to another school.

In another ward, a big Irishman, a graduate of Trinity College, Dublin, had to chastise a boy, and was called to account by the father who called to see this Irishman. In an instant a cowhide was drawn to be used upon the teacher, who seeing what was about to happen, backed away to avoid the danger; followed by the man. Reaching the wall at the rear of the building, the principal had to stop his retreat, and drawing a revolver from his vest pocket, pointed it at the man, who not liking the appearance of the gun, turned and started for the gate by which he had entered. The teacher was near him as he reached the gate, and applying his foot as deftly as he could, kicked his adversary into the street.

After these incidents, Miller went down St. Charles street and bought a loaded cane, which he carried every day to his schoolroom, placing it by his desk so that it might be handy in case of need. There was a boy in his school, the son of a coal dealer, who gave the teacher a deal of trouble. So the boy was punished. The next morning, a note from the boy's mother was received, informing the teacher that the boy's father would not allow anyone to punish his boy, and suggesting that when the son needed it, he would be attended to at home. A note from the teacher informed the lady that the board of education had employed him to run the school, and he intended to do his duty. The next morning the boy appeared at his seat, packed up his books and left, after which peace reigned in Warsaw. Northern teachers had to meet southern blood, in the city of New Orleans in those days and it required tact, wisdom and courage to stem the current.

During the holidays of that season, Principal Kline took to himself a bride, who was a widow with two beautiful little girls. It was in the summer of 1853 that New Orleans suffered the worst visitation of yellow fever in all its history. On each of two days in the month of August of that year, 200 dead bodies were carried to their last resting place. Miller saw in one of the City's cemeteries two trenches, one 150 feet long, the other 75 feet, each filled with victims of the dread disease. Kline took the fever, and was nursed back to health by the widow. Then the widow was taken down, and Kline in turn nursed her back to her wonted health. Then the two little girls were taken down, and they were nursed by both Kline and the widow. At the Christmas season the two were married, and went to housekeeping. In short time Miller and his associate were invited by the newly married couple to board with them and the invitation was accepted.

An incident occured shortly after the two teachers began boarding with the Klines, which pointed toward a tragic ending. Mrs. Kline, accompanied by a pet house dog, one day made a call upon an old friend of her husband. This gentleman had a great dislike for dogs, so when he saw the lady's dog he politely kicked it out of the house. The lady was terribly insulted, and at the supper table demanded that her husband challenge his friend to mortal combat. It was of no avail. He refused to do it. She turned to Miller to second her appeal, but he also declined as well as he knew how. That was the nearest approach to being a participant in a duel that Miller ever had.

Before leaving their rooming place on Trivoli Circle, as it was then called, the landlady gave a banquet for two Cubans, friends of hers, to which the two northerners were invited. The Cubans were splendid looking fellows, who were in the city seeking recruits for the army of filibusters, to enable the island to free itself from the yoke of Spain. Miller was offered a Leutenacy in that army, but he declined with thanks.

Kline and his two boarders often talked about the South and southern affairs. One evening the subject of slavery was discussed. Kline said he could tell a secret, but declined to reveal it, unless his boarders promised never to make it known. They promised. There was in his possession a book, that if it got noised abroad in the City that he had it, would bring down upon him serious trouble. The book was "Uncle Tom's Cabin". The Saturday following the revelation of the secret, Miller read the book through. There was in it a description of a hotel in the southern part of the city, in which hotel, slaves were bought and sold. The next Saturday Miller went to the hotel named, and upon entering the rotunda, at once recognized the place from the description given in Mrs. Stowe's famous book. The rotunda was fitted up as an auction room. There were present quite a number of white men, twenty-five or thirty black boys averaging perhaps 16 or 17 years of age, and a colored woman, nearly white with the most beautiful little girls that Miller had ever seen. The boys were examined just as a horse dealer would examine a horse. Their arms and legs were pinched; and they were made to walk forward and backward; and they were made to open their mouths, to show their teeth, and thrust out their tongues. They were put on the auctioneer's block one after another, and were rapidly disposed of at $1,600 apiece. When the woman and her little girls were put on the platform, it seemed as if bedlam had been let loose. Every body wanted to buy the three victims. The bids came in thick and fast. She was at last sold to a villianius looking scoundrel for $1,900. The woman seeing who the purchaser was, turned her face to the wall and wept like a child.

Dan Rice, the famous showman, was wintering in New Orleans that season, and every afternoon had a log cabin mounted on a wagon over which he placed a white canvas on which were painted in large letters the words: "Uncle Tom's Cabin by Harriet Screecher's Toe, this afternoon and evening." One Saturday having drawn his monthly salary, Miller was standing on the marble steps of the City Hall, watching the crowds passing by. All at once he heard some one whistling Yankee Doodle. A company of one hundred well dressed negroes marching two and two were passing by. A large fine looking fellow seeing Miller left the ranks, with hat in hand, and drawing near said, "Marsa, don't you want to buy me?" Miller replied that he had all he desired at that time.

Just across the street from Kline's, lived one of the city judges, who was the owner of a dozen or more slaves. One night after Miller and his roommate had retired they were awakened about the hour of twelve, by the groans of some one in great agony. The Judge was whipping one of his slaves, but for what reason no one in the house knew. Every cry for mercy was met by lash after lash, the Judge at intervals saying, "I'll show you mercy, I'll show you mercy".

Miller's roommate rose up in bed, mad as could be, and grinding his teeth ejaculated, "Judge, if I could only get you out somewhere in the woods I would make you cry for mercy!" Miller's roommate hailed from Ashtabula County, Ohio, near where Joshua R. Giddings lived, a man known everywhere as an intense anti-slavery man. That part of Ohio was one of the localities where red hot abolitionists flourished without let or hindrance. Run away-slaves always found there a safe refuge.

When the city schools closed for the summer vacation, the two northeners took passage on the ocean steamer Daniel Webster for New York. This steamer afterwards carried supplies for Major Anderson at Charleston, South Carolina, at the beginning of the Civil War.

All in all, the year spent in New Orleans, was one that Miller has ever regarded as one of the best years of his life. He was re-elected to the same position as a teacher for the following year at an increased salary. Declining the honor, Miller returned to the North, and in September of 1854, re-entered Allegheny as a senior.

The net proceeds of the year's teaching in New Orleans amounted to $400 dollars, and of this he gave his father $100. Miller never had so much money before, and what was prized by the boy more than anything else, it was all in twenty dollar gold pieces.

In Allegheny College, as in other colleges of that day, nearly all the work done was in boarding house rooms, and in the class room. Text books were the principal sources from which to prepare lessons. The laboratory was for the most part an unknown thing. The teachers did not use the laboratory method, and of course the students had to blunder along the best they could. Now all science, psychology, chemistry, physics, history, even the classics and mathematics, must pass through the laboratory process. And as a handmaid, the

Library must yield its treasures in order to carry on that highest form of educational work--research.

Very many of the subjects found in the college curricula of today, were not in those of the middle of the last century; English literature is almost entirely a new subject. But the new ones, those that are high up in the list of today, such as economics, sociology, biology, business, journalism, domestic science, and others, were not even dreamed of. The advance has been most wonderful in quantity and quality, and shows what tremendous changes have been made in the work of educators.

The professors of those days were highly educated men, accomplished, intelligent and approachable, but the laboratory method, as it is now understood was a terra incognito.

The senior year was to Miller, his very best. Friendships were made that have lasted all through the years. But there were many things that are now very prominent, that did not exist, or if they did exist, were very rudimentary. Phi Beta Kappa, Sigma Xi, the students' fraternities and sororities, all were conspicuous by their absence. Football, basketball, baseball as now played and many other forms of athletics were unknown. A few simple exercises, such as jumping over bars, swinging by means of suspended ropes and exercises on ladders, comprised about all that was known.

Miller remembers that he was able to clear 19½ feet on one running broad jump. He tied with another student in this. Of the twenty-two students who graduated in 1855, Miller is the only survivor.

During the winter term of his senior year, Miller was invited to board with a farmer, who lived four miles away from the College, for which the farmer's three children were to be taught from 2 to 5 every day. Miller taught in the afternoon and in the evening his own lessons had to be attended to, and then the mental review. He had to be up at 5:30 in the morning, eat his breakfast, walk four miles and be in class at 7:30 o'clock. One morning, the mercury at 10 below, Miller caught up with one of the professors. The sun was just peeping over the tops of the eastern hills. The professor looked at the young fellow, and exclaimed, "Miller, what is the matter with you. Your face is so red, and you are sweating!"

In ten days after leaving College, Miller was married, so that beside his bride, he had his College degree and sheepskin, and fifty dollars in money. Life now took a new phase. What should he do? Where should he go? Troublesome questions for a young man just out of College, and largely ignorant of the ways of the world. But soon an answer came. The President of Allegheny, in reply to a request that he recommend a recent graduate for the position of superintendent of city schools at Youngstown, Ohio, sent in Miller's name. He got it.

From 1855 to 1925, Miller has been a wood chopper, a harvest hand, a would-be-farmer, a common school teacher, a high school teacher, a superintendent of city schools and for 36 years professor of mathematics and astronomy in the University of Kansas, and since 1910 is Emeritus professor of mathematics and astronomy in K. U.; is a beneficiary of the Carnegie Foundation for Advancement of Teaching, and is now growing young at 558 North Lake Avenue, Pasadena, California, where he will be pleased to meet friends old and new.

## Appendix II

## K. U., 1903-1911

by Wilimina Everett (Mrs. Arthur Dunn) Pitcher ('07)

Written in February and March 1971

# K.U., 1903-1911

by Wilimina Everett Pitcher ('07)

I am not sure how much or little I am expected to write. Everett asked me to put down things that I remembered about the math department from 1903 to 1911. I am writing this as though I were writing for family records. I have used old K.U. Annuals (I believe they call them Year Books now), newspaper clippings, letters, and my own memory. I have Annuals 1904, '05, '06, '07, 1911, and the Quivira, 1893, given to me by Mrs. R. D. O'Leary, who said it was K.U.'s first Annual. Both Professor and Mrs. R. D. O'Leary were members of the Class of 1893. *Professor* Miller and *Associate Professor* Newson were members of the faculty in 1893.

I have tried to be accurate. It occurs to me that I am probably the only person living, who lived through this period and has these facts available. The clippings and letters (Mathematical) were among my husband's possessions. This will, of course, contain much about A. D. Pitcher.

I entered K.U. from Ft. Scott High School in the fall of 1903, the greenest, most unsophisticated member of the freshman class. No girls and very few boys from our town went to college. I intended to become a high school mathematics teacher.

The math department as I remember it, consisted of Professor Ephriam Miller, Ph.D., Alleghany College, 1895; Associate Professor Newson, Ph.D., Ohio Wesleyan, 1892; Assistant Professor J. N. Van Der Vries, Ph.D., Clark, 1901; and Assistant Professor C. H. Ashton, A.M. Harvard, 1893. Ashton was appointed to K.U. in 1903. He got his doctorate in Munich, 1909.

Those four were the math department as I recall it. It was top-heavy with professors. If there was any one with the rank of instructor, I do not recall him. There surely must have been. There seemed to be so many prospective engineers, though only 40 are listed in the graduating class of 1907. Some had become dropouts, some had changed to other departments.

One engineer who changed to college was a man named Arthur D. Pitcher. He took the seat next to me the first day of English class, sat next to me all semester and shared my English text book the first two or three weeks of school. I never visited with him. I was interested in college courses, not K.U. engineers. I married him in September, 1910.

I was delighted to be assigned to Professor Miller's trig class. I had studied trig in Ft. Scott and used Professor Miller's trig text book. At that time, 1903, K.U. had no retirement age, no pension fund. I suppose, now, that Newson was head of the department. I never heard of such a rank in 1903. Professor Miller was a great favorite among students. Our 1907 Annual was dedicated to him. According to 1907 Annual listing, he had been active as an author and member of learned groups. In 1903 he was probably teaching a limited schedule. I feel that any student who was not in one of his classes missed a valuable part of a K.U. education. He was an interesting, kind, friendly gentleman.

I graduated in 1907, taught high school math the year 1907-08 in Abilene, Kansas and two years 1908-10 in Lawrence High School. Arthur Pitcher, to whom I was engaged, was enrolled in graduate classes in K.U. The 1906 Annual lists both Arthur and Mitchell as Assistant Instructors. Each got his A.B. the first half of 1905-06.

My husband was a newspaper clipping and letter saver. We never saved social or family letters. According to clippings, he passed teacher examinations at age 16 with marks entitling him to a first grade certificate. He was given third grade because of lack of teaching experience. He was allowed to teach in small town schools. At 19 he was given first grade rating. Clippings say "before he was of age" he was principal of Havensville School (with Professor Arthur D. Pitcher printed on letter heads) and 33 pupils in high school classes. Many clippings call him Professor Pitcher. He was accepted as a student in Campbell College, Holton, Kansas, while teaching in Havensville. He therefore sent in his resignation as principal. Before his resignation took effect he was stricken with rheumatic fever and spent the last month of his principal-ship in bed. He was forced to give up college plans for one year. Rheumatic fever left him with a heart defect which caused his death in 1923.

When he had recovered sufficiently from rheumatic fever, he enrolled in Campbell College, Holton, Kansas where he graduated in 1903. I have a record of his courses and marks in Holton at Campbell College. He had

30 hrs. of algebra, through quadratics. *Wells Alg.*

30 hrs. of arithmetic. *Wells & Rays Higher*

20 hrs. *Wentworth Geometry Books I thru VIII*

He completed 46 ten-hour courses. The entire curriculum sounds like a good course in an ambitious high school. He had some French, German, and 20 hrs. of Latin. He entered K.U. in 1903 at age 23 conditioned in Latin. I think U. G. Mitchell entered at the same time. I have a faint remembrance of him in Dr. James Naismith's hygiene class. Mitchell had a teacher's certificate from Central Normal College (I don't know where that was) date 1898. He was married. I think he was several years older than Arthur. The 1906 Annual says Mitchell was Fellow in Education in 1904 and 1905, and Instructor in American History 1905-'06. I was not aware of Mitchell again till my junior year. I believe his interest in math started in K.U. During my junior year he taught a small, very interesting class, History of Math. Most of the class did not know math had a history. Both Arthur and Mitchell taught freshman math, took advancedmath courses and obtained A.M.'s in 1907. They also taught and did advanced math under Newson 1907-08.

March 20, 1908 Arthur was offered a $450 graduate fellowship at the University of Illinois. He did not accept. He had credit at University of Chicago for summer-quarter courses 1906 and 1907. He accepted a $320 fellowship at Chicago and earned his Ph.D. under Professor Moore in 1910. The same year U. G. Mitchell, on fellowship at Princeton, was awarded [a] Ph.D. under Professor Fine. Both Arthur and Mitchell were granted an extra year's leave from K.U. in order to finish work for the degree.

Among my collection I have two interesting letter to Arthur from Newson.

*On April 7, '09.*

He wrote that he regrets not being able to attend a math meeting being held in Chicago. He has been out of school two weeks with grippe and expects to be out at least another week. He said he did not know whether Gaba was staying next year or not. He follows this with the statement, "We may need an $800 man next year. Look around and let me know if anything good is in sight." He also asks Arthur to "cast about" for a Professor of Physics for us. In this same letter he writes about Professor Miller. I'll discuss that later. Also, I'll talk about the other letter later.

Meyer? Gaba was an experiment. There were no Jews on the faculty and Newson did not know how Gaba would be received. He had good recommendations from Chicago. When he was being hired he was told that he might not be well received and was asked to overlook unintentional slights, etc. Gaba, who could always be depended upon to say the wrong thing at exactly the right time was introduced to a small faculty group. Gaba said, "Where is the nearest synagogue?" I think Gaba stayed at K.U. 1909-1910. He was in Dartmouth 1910-11 and after.

Newson, in his *letter April 7, 1909* says "Our Carnegie resolution passed the legislature all right, but I understand Professor Miller will not apply for it this year."

In those days K.U. had no retirement age, or no pension fund. In 1909, Professor Miller was 76 years old, had been at K.U. since 1874, thirty five years. K.U. had worked to get the Carnegie Pension so that Professor Miller could retire. He didn't. He taught the year 1909-10. The year 1910-11 the Millers were getting rid of some of their possessions, preparing to move to Pasadena. Everett has a very old math book, I think it is geometry, which Professor Miller gave to Arthur. When my husband died in 1923 I had a very nice letter from Professor Miller, age 90. He lived two or three years after that. Mrs. Miller out-lived him. They were on Carnegie Pension from 1910.

<u>Letter from Professor Newson December 8, 1909</u>

He explains that he was not able to go to Columbia to the meeting of the Southwestern section. Mrs. Newson is in the hospital with a new baby boy. He is quarantined at home with Josephine and a nurse and scarlet fever (Josephine).

The rest of the family are living out; his classes are working under assistants. He is working on calendar for next issue. "The department is to be thoroughly overhauled." He says he and the deans are unanimous in wanting Arthur back. The question of an astronomer is an uncertain feature. He does not know what it will cost to get the right kind of man. "Practically agreed that they can give Arthur $1100, rank of instructor; "this will mean $1200 and an Assistant Professorship the year after."

"I am planning the graduate courses for the future, and have set you down for a course in Real Variable throughout the year; and another one in Celestial Mechanics. The latter may go to the astronomer, if he is properly qualified to carry it. Let me know what else you would prefer to offer. What about General Analysis?"

"Did I tell you that I got a special appropriation for books of $750. Most of this will be spent for serials; it puts our Mathematical library in pretty good shape. I feel that the outlook for the department is excellent."

The letter ends "P.S. This letter has been fumigated and is safe to handle."

I have quoted generously from that letter. It is the last one I have from Professor Newson.

I don't know when Newson died or why. He was only 49. Did he get Scarlet Fever from Josephine? Writing this still makes me very sorry for Mrs. Newson. She was a young woman with a baby about three months old and other little children, one being Josephine, who was probably hearing, "Your father died because of your scarlet fever."

The next important letter in my collection is from Chancellor Strong, dated March 17, 1910, in reply to a letter he received from Arthur, February 28, 1910. In it he says he does not see that Professor Newson's death should in any way interfere with Arthur's return, and that all of those concerned count on Arthur's return. He said Newson had made no definite recommendations as to salaries. Recommendations had to come to the Chancellor through the head of the department and the dean of the school concerned.

After exchange of several letters with Dean Templin, Arthur accepted Assistant Professor; year to year appointment $1200 per year. After three years it would go to $1300 with $100 yearly increase to $1600. This we accepted. We were married September 5, 1910 (Labor Day). Arthur went to work a few days later, enrolling freshmen. Of course we were in debt. I had no job. Married women were not allowed to teach in Lawrence or any other place I knew of.

## The Department Personalities

## 1910

In 1910 the math department consisted of

Professor J. W. Young, head, Cornell Ph.D. appointed 1910

Associate Professor (?) J. N. Van Der Vries, Clark Ph.D. 1901, appointed K.U. 1901

Associate Professor (?) C. H. Ashton, Munich Ph.D., appointed K.U. 1903

Assistant Professor U. G. Mitchell, Princeton Ph.D. 1910

Assistant Professor A. D. Pitcher, Chicago Ph.D. 1910

Assistant Professor Marian White, Chicago Ph.D.

Instructor A. B. Frizell, A.M. Harvard

Instructor Paul Wernicke, Ph.D. Gottingberg

Hazel McGregor, Fellow in Math. A.B. K.U.

That was the department as published in the 1911 Annual. That was a big department. All had attended reputable schools. Most had Ph.D.'s. Of the first five, four should have felt at home. According to Newson's letter, December 1909, the outlook for the department was good. Carnegie Pension was available, Math Library had extra funds, an astronomer was to be hired to take Professor Miller's place. I do not know where Gaba was. He was in Dartmouth 1911-12 our first year there. I never heard of Wernicke till I saw his name in 1911 Annual.

Marian White may have been an experiment. K.U. boys were not used to women in the math department. She was there because Young brought her. I don't know whether she stayed after Young left. Arthur knew her before she came to K.U. She was a very likable person.

I remember Frizell. We invited him to our house for dinner. He was shy, seemed afraid of faculty wives. He didn't know how afraid I was of department men. He seemed a misfit in the department.

Van Der Vries had a new wife acquired sometime between 1907 and 1910. I don't remember her or her background. I was too new a faculty woman to collect much faculty gossip. Arthur was too interested in giving a good performance in his new job to be hearing much gossip. If there was any friction he wasn't telling me. He "protected" me. Van Der Vries probably felt secure in his job. He was not interested in research. Ashton, new Ph.D., probably would do some research with proper encouragement. I don't know whether either of them had any desire to be department head. Every one seemed calm.

Then we were told Young was going to leave. Young, a Cornell Ph.D., probably was glad to get the Dartmouth offer. In the early 1900's there seemed to be a widespread feeling of "Go East, Young Man". Kansas probably seemed a good place to go from.

Many new faculty women, coming to K.U. from eastern states, were surprised at our general state of civilization. They were surprised that our only Indians were peaceful, well housed and well cared for at Haskell. One woman, not a math department wife, who marvelled at what she found in Kansas, told that before she packed to come, she bought a dozen pairs of kid gloves, because she was sure she could not buy any in Lawrence.

## The Youngs

The Youngs had a baby daughter. Mrs. Young's sister spent time with them. The four of them were living in a house which the Newsons owned and had lived in for years. The Newsons had cats. I don't know how many - two or more. Being normal cats they had fleas. Early in the school year the Youngs moved out of the house for several days and had it fumigated. Mrs. Young said they were over-run by fleas. I don't know how many or how bad the fleas were. I don't suppose the flea story made Mrs. Young popular. The Newsons were old residents of the community.

## 1910 - 1911

Newson's death was certainly an upsetting shock to K.U. and the department. Professor Young's coming must have been a big relief. Then, when before the school year was over, Young announced that he was leaving, department members may have felt their jobs were insecure and were making inquiries among their friends for desirable vacancies. K.U. was becoming an unhappy place, a good place to get away from.

We were surprised when Arthur was asked to go to Dartmouth. He had taught 1910-11 at K.U., $1200 for 3 years with prospect of $1300 for the fourth year, then $100 yearly increase to $1600. I can't find, though I must have, Dartmouth's original offer. As a result of the offer, K.U. raised to $1300 the second year, with $100 yearly increase to $1600. Arthur agreed to stay and asked that Mitchell be put on same schedule. Then Dartmouth offered $1600. That meant $400 more than the 1910-11 salary. He felt that was too good to turn down. He accepted the Dartmouth offer.

Professor Young was a Cornell Ph.D. Dartmouth was a highly respected Eastern College. Being head of a department at Dartmouth probably sounded better than being head at K.U. The salary was probably better at Dartmouth. I do not know.

There were several reasons why Arthur and I left. Arthur keenly felt the loss of Newson. They would have done research together. Arthur needed the stimulus of other researchers. Ashton might have gone on with research but Arthur was not sure. Arthur and Mitchell were good friends. Arthur wanted to remain friends. There would probably always be rivalry for position in the department. The fact that Dartmouth was a good school coupled with better pay had a big influence on Arthur's decision. Arthur was thirty years old. He felt very responsible for me. Rheumatic fever left him with a defective heart. He could not get life insurance.

The Youngs were always our good friends. That made getting accustomed to life in Hanover easy. I have never been sorry for our four years in Hanover. I am very glad that after four years we went to Cleveland. Cleveland was a much better place than Hanover in which to be left a widow with a young child.

I have enjoyed writing this. Perhaps there is nothing that will help. If I had plenty of time I might have gone over this and condensed it. It might then have lost its feminine touch. Even at 86 I can insist on Women's Rights.

I hope this helps. Is it out of place for me to ask for a copy of your product? It would go with Arthur's collection which I shall leave behind some day.

With best of wishes for K.U. and
the Mathematics Department,

Wilimina *Everett* Pitcher (07)

## Appendix III

### Henry Byron Newson and Mary Frances (Winston) Newson:

### Letters Written by Caroline Newson (Mrs. Hugh M.) Beshers

1. Caroline Newson Beshers to Miss Smelser, June 2, 1951
2. Caroline Newson Beshers to G. Baley Price, August 22, 1971
3. Caroline Newson Beshers to G. Baley Price, September 20, 1971

1. Caroline Newson Beshers to Miss Smelser, June 2, 1951*

2914 Kanawha St., N. W.
Washington 15, D. C.
June 2, 1951

Dear Miss Smelser,

Here is the picture of my father which I promised you so long ago. He was born July 10, 1860 and died February 17, 1910, as you remember. The 1909 Who's Who gives a biographical sketch. It does not mention, I think, that his money ran out before he got his Ph. D. and he had to cable his family from Germany to send him enough to come home. He probably never had very much in the first place. The three years of study, at Johns Hopkins where he studied chemistry, and at Heidelberg and Leipzig, represented long and patient saving from his years of teaching in various out-of-the-way places. He was teaching in Louisiana when he went to Germany--in a colored school, I think. At any rate he would only have received a pittance.

My father's most dominant characteristic I think was his dry wit, and his determination to seem a somewhat cynical character. Actually he was the kindest of men, looking after his mother and sisters as well as his wife and children, and all on a most meager income. His deep love of literature, especially of poetry, is noteworthy too in a man of science. His last book, a Theory of Collineations, foreshadowed some of the modern discoveries, but I am not able to say to what extent he anticipated Einstein, though I have heard that suggested.

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* This letter is in one of the Faculty Scrapbooks in the University Archives in Spencer Research Library.

Thank you for your patience. I do not know why people postpone these things.

Sincerely,

/s/ Caroline Newson Beshers

(Mrs. Hugh M.)

2. Caroline Newson Beshers to G. Baley Price, August 22, 1971

Mrs. Hugh M. Beshers

Jefferson

Maryland 21755

August 22, 1971

My dear Dr. Price,

Mr. Harold [sic] Youngberg has told me that you have been writing a history of the University of Kansas Mathematics Department and that such a survey has of course included my father, Henry Bryon Newson. I know you know more about his career as a teacher than I do, for I was eight years old when he died, but I do hope you will allow me to express my pleasure in your work, and to add a few details you may not know.

None of the obituary notices mentioned by mother, neé Mary Frances Winston, in 1900 head of the department of mathematics at the Agricultural College in Manhattan. Actually I believe she was the whole department. She was the first American woman to take a degree in mathematics from a German University and as such must have been rather awe-inspiring, at least by reputation. Actually she was unassuming to a fault. But I think in that day (if not in this) it was an unusual man who married a woman with many years more schooling than himself, especially in the same field. But she often spoke of the great handicaps under which both of them worked. For undergraduate degrees many hours of classical studies were required, and the schools were rigid about curriculum. Once she petitioned the University of Wisconsin to permit her to carry 24 hours in one semester, but they refused. Her family, by no means wealthy, were sympathetic and she managed to get three years of graduate work at Bryn Mawr and the University of Chicago before she met Dr. Felix Klein of Göttingen at the Chicago Worlds Fair who encouraged her dream of studying abroad. "If she came and Göttingen refused her he thought she could get in at Zurich." With all this she felt herself inferior in training to an English girl, Dr. Grace Chisholm Young, who entered Göttingen with her and who had already taken the Cambridge Tripos. She must have caught up, however, for they both got Magna cum. By contrast my father, who worked his entire way through Ohio Wesleyan, must have had less mathematics when he graduated than a junior college would require of a major now. Actually he was a chemistry major, and that is what he studied during his year at Johns Hopkins. That in his brief two years in Heidelberg and Leipzig he was able to get into Sophus Lie's classes and able to grasp that Lie and not Klein was the man of the future seems little short of phenomenal.

Sometime in the nineteen-forties Ruth Jane Gagliardo met on a train a man from the Cornell Math department, who asked if she had ever heard of a man named Newson. He had stumbled onto his work, and thought him one of the great thinkers of his generation, on the track of relativity before Einstein. Neither my two older sons nor my brother, all of whom are in related fields, has found anything in Collineations or in anything else that we have anything which might suggest any such pioneer work, but the obituary refers to work in "the Fourth Dimension" and I think somewhere there must be an article we have missed, or how could the Cornell man have got any such idea? I know

Collineations is in the Library of Congress but doubt that articles will be easily located there. In fact that is quite an understatement. If you have any suggestions as to where I might look, I would be very grateful. Perhaps K. U. would be interested if any such large claim could be in any way substantiated.

My mother (who died in 1959) has frequently told me that in the last year of his life my father was head of the Department. My brother points out that Who's Who does not say so, but if the promotion came through in the summer of 1909 it would have missed the edition of that year. The 1910 volume just states that he had died. At any rate she said that Professor Miller (whose first name I never heard) continued as titular head after his health was so poor that he could not work at all and even after he had gone to California to live. He also received his full salary until his death. Although this was a great blessing to his family, my mother felt it worked out as an injustice to her husband who carried the work assigned to both of them, while he himself had a bad heart and could not even get life insurance. In 1909 he was given the full pay for a department head, $2500.00! In all fairness I must add that this was adequate for life in Lawrence at that time.

My father's most marked trait was his sharp wit, but I suspect it made him enemies. People could not always tell when he was joking. Once when my sister climbed something high and forbidden and fell, he told her if she had broken her neck she'd have had a good spanking; and we were both scared. He seemed dead serious. Also he had an enormous contempt for pretentiousness, and very likely pricked bubbles. But in private life he was the kindest of men. The only heretic in his devout family, he was also the one who cared for his mother and two sisters. My mother, never at ease with domestic tasks, married into a home already filled with competent, intelligent women, and there were some resulting strains. I think the situation was harder on my father than anyone else, but he never at any time expressed irritation nor spoke without gentleness and courtesy. Sharp comments were reserved for the outside world.

One of his jokes was to say he was golf champion of the State of Kansas, because once he had defeated in an informal game a man who had some such title. But actually he did play a very good game, especially considering how little time he had for practice. My mother said on fishing trips (which he enjoyed immensely) he would sink a tin can and putt in odd minutes. He also prided himself on his skill as gardner, carpenter, and especially plumber. For the latter of these hats he owned a professional set of tools and boasted he was the equal of any plumber in town. I was a little shocked, and I fear other people may have been. In that day doing-it-yourself was by no means in vogue . . . .

I remember hearing him say that Professor Paul Wernicke, a German whom he had, I think, sponsored was the ablest man in the department. I don't know what became of him. My mother in her foreword to Collineations thanked him for his help as well as Mr. Mitchell for his. (Characteristically she did not say that she herself had done most of the work.) But I do remember that when he came to the house German was spoken. I found this very exciting. I could say please and thank you and I found by inquiring the words for "a little." "Papa," I asked, "if somebody asks me 'Sprichst du Deutsch?' should I say 'ein wenig'?" He answered with a smile which had no ridicule, "You'd better say 'Sehr wenig.'" And I did, with pride.

Yours very sincerely,

/s/ Caroline Newson Beshers

P.S. I have turned up an old letter written to my mother by Rose Morgan in 1949. She tells of Ruth Jane's acquaintance with my father's admirer, but she does not mention Cornell. She has the name but there is a blot on it. But I shall write to Mrs. Gagliardo for more particulars. If she remembered the man's name then, she may still do so. Anyway I owe her a letter.

C. N. B.

3. Caroline Newson Beshers to G. Baley Price, September 20, 1971

Mrs. Hugh M. Beshers

Jefferson, Maryland 21755

September 20, 1971

My dear Dr. Price,

Thank you very much for your wonderful letter. I found it waiting for me when we came back from New England, and I am answering informally so you will know I got it and appreciated it. . . .

I was very much interested in learning more about Professor Miller, whom I'm sure I never met. Professor Carruth on the other hand was a warm friend and well remembered. Some years ago my oldest son worked on a summer job with an older woman, who was doing some kind of computing (not mechanical). She was a KU alumnus, and smiled when asked if she had known Dan's grandfather. She said, oh yes, she had started to major in math, and Professor Newson had encouraged her but had added she should concentrate on her major and drop her heavy language load. She thought this over but when she realized it would mean giving up Mr. Carruth's class she dropped the math!

I am glad Mr. Moore* was so popular. Mathematics is the most exacting of the disciplines, and since it was required many of its instructors met with

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* An error; Mrs. Beshers almost certainly intends to refer to Professor Ephraim Miller here. G.B.P.

something less than affection. Though it is not hard to understand my mother's bitterness since overwork, she was sure, killed her husband at forty-nine, and she was left without one benefit, not even an extra pay check. The Carnegie pension required twenty years service, while my father died in February--thus making 19½ years at K. U. That was the way things were at that time.

I was interested to know of Dr. Young.* I think he was the baby who was parked outside the classrooms while both parents continued their courses in advanced math. My mother visited Dr. Young in Switzerland in 1929. Her marriage had broken long before--perhaps due to professional jealousy.

I will try to brave the dragons in the Congressional Library who spend their lives trying to keep the sons and daughters of men from learning anything. Some years ago Congress complained that the public used *its* library to excess, and books it or they needed were not available. They have now gone to the other extreme. However I will hunt for a sympathetic human being among the librarians and perhaps not seek in vain. Thank you for the directive.

My bother is James Biddle Duke Professor at Duke. He is in charge of all AEC programs, and has made many firsts with his Van de Graff machine. One is: he runs a cyclotron with the Van de Graff which makes for acceleration. Please forgive me if I do not enlarge on this. I may even have the words wrong!

My oldest son is a solid state physicist. He is a professor in the Columbia School of Mines, Columbia University. My second is also a full professor of Sociology in the University of the City of New York--Queens College campus. Some years ago he gave a paper in Rome to a Society of Sociological Mathematicians--we thought that sounded better than mathematical sociologist. He was a pioneer in the field of computing and has written several books--one

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* Professor L. C. Young of the University of Wisconsin.

of which on computation (I am not at home and cannot look up the title) has recently come out in a revised edition from the MIT press.

The third son is an economist with the government and an aide to the Secretary of Transportation.

My husband is an engineer, and very successful in his field.

Alas I did not become the great mathematician my father predicted to the Marvins when I was born.

I am sorry the house I was born in is going down. I wonder if my grandfather's house at 1620 Mass is also doomed. That was once quite a faculty neighborhood.

I again say thank you. I am getting duplicates of your letter made for my brother and sister.

And I want to congratulate you on your industry in getting out a comprehensive history of the math department. Papa would have applauded you with great enthusiasm.

Yours very sincerely,

/s/ Caroline Newson Beshers

P. S. My husband says Henry's combination of cyclotron and Van de Graff was made in the face of general skepticism. Now he has succeeded it is being done at California.

Henry was one of Lawrence's assistants on the first cyclotron at Berkeley and was with the Manhattan Project.

C. N. B.

P. S. no 2--

My mother taught some years at Washburn College, then changed to Eureka in Illinois where she was head and nearly all the department. She taught everything the school needed--even elementary engineering, going out with the boys and their transits. In about 1941 she was chosen by Carrie Chapman Catt to be honored as one of 100 women to succeed in positions once open only to men. Again quite characteristically she declined the invitation to come to New York because she could not leave her classes, and told no one of the honor. It came out only when reporters called the college office for material for articles.

C. N. B.

Appendix IV

Ulysses Grant Mitchell, 1872-1942

1. Ulysses Grant Mitchell: Curriculum Vitae, Prepared by G. Baley Price, March 15, 1974

2. Letter from U. G. Mitchell to Chancellor Frank Strong, April 13, 1903

3. Letter from Chancellor Frank Strong to U. G. Mitchell, April 17, 1903

1. Ulysses Grant Mitchell: Curriculum Vitae.

Mitchell, Professor U(lysses) G(rant)

Born: November 26, 1872 in Nashua, Iowa

Died: January 1, 1942 in Lawrence, Kansas

Professor Mitchell's residence at the time of his death, and for many years before that time, was located at the following address:

1313 Massachusetts Street
Lawrence, Kansas

In the spring of 1885, when Professor Mitchell was 12 years of age, his family moved from Iowa to Kansas; they traveled in a prairie schooner and settled near Peabody, Kansas.

Professor Mitchell married Lulu Grace Hunt of Peabody, Kansas on September 1, 1898. Professor and Mrs. Mitchell had no children.

Professor Mitchell had three scholarly interests as follows:

(a) history, especially the history of mathematics;
(b) the education of teachers of mathematics;
(c) mathematics, especially projective geometry and the theory of groups.

<u>Education</u>

| | |
|---|---|
| 1892 | Graduated from Peabody (Kansas) High School with highest honors in a class of fifteen members |
| 1895-1896 | Student at the University of Nebraska, Lincoln |
| 1896-1898 | Student at Central Normal College at Great Bend, Kansas |
| 1898 | A.B. degree, Central Normal College |
| 1904-1908 | Student at The University of Kansas, Lawrence |
| 1906 | A.B. degree, The University of Kansas |
| 1907 | M.A. degree, The University of Kansas |
| 1908-1910 | Graduate student in mathematics at Princeton University |
| 1910 | Ph.D. degree in mathematics, Princeton University |

## Professional Experience

| | |
|---|---|
| 1892-1895 | Country school teacher |
| 1896-1898 | Part-time instructor in mathematics and German (while a student) in Central Normal College, Great Bend, Kansas |
| 1898-1902 | Superintendent of Schools in Hillsboro, Kansas |
| 1902-1904 | Superintendent of Schools in Lyons, Kansas |
| 1904-1905 | Fellow in Education, The University of Kansas |
| 1905-1906 | Instructor in American History, The University of Kansas |
| 1906-1908 | Instructor in Mathematics, The University of Kansas |
| 1908-1910 | Teaching Fellow, Princeton University |
| 1910-1915 | Assistant Professor of Mathematics, The University of Kansas |
| 1915-1920 | Associate Professor, The University of Kansas |
| 1920-1942 | Professor, The University of Kansas |
| 1931-1941 | Chairman, Department of Mathematics, The University of Kansas |

## Professional Recognition

Professor Mitchell was present as a delegate from the Kansas Section at the formation of the Mathematical Association of America in Columbus, Ohio, in December 1915.

Professor Mitchell was an associate editor of the *American Mathematical Monthly* for volumes 23 (1916) through 28 (1921). The dates just given are those recorded on the title pages of the journal, but Professor Mitchell himself has stated that he was an associate editor of the *American Mathematical Monthly* for volumes 21 (1914) through 26 (1919).

## Dissertations Directed

Professor Mitchell directed a number of dissertations, but one of the students whose dissertation he supervised is especially noteworthy. Charles E. Rickart received a master's degree in 1938; his dissertation, entitled "The Pascal Configuration in a Modular Plane", was supervised by Professor Mitchell. Rickart became a distinguished research mathematician; he is a Professor of Mathematics at Yale University and has served as the Chairman of the Department of Mathematics there.

## Memberships in Professional Organizations

American Association for the Advancement of Science
American Mathematical Society
Mathematical Association of America
History of Science Society
Kansas Academy of Science

## Bibliography


(a) Book

1. (with Helen M. Walker) *Algebra - A Way of Thinking*. New York: Harcourt, Brace and Co., 1936. xvi + 400 pages.
   Reviewed in *The Mathematics Teacher*, vol. 29 (1936), p. 262.

(b) Articles

1. Princeton Dissertation, 1910: "Geometry and collineation groups of the finite projective plane $PG(2, 2^2)$." Lawrence, Kansas, 1913, 45 pages.

2. "Geometry and the collineation groups of the finite projective plane $PG(2, 2^2)$." *Bulletin of the American Mathematical Society* (2), 17 (1911), 521-522.

3. "The growth of algebraic symbolism." This article is pp. 226-239 of the following book: J. W. Young. *Fundamental Concepts of Algebra and Geometry*. New York: The Macmillan Company, 1911.

   Professor Mitchell's article was translated into Italian by Domenico Marcogliano and published as "Sullo Sviluppo Storica del Simbolismo Algebrico". Napoli, Luigo Pierro, 1919, 21 pp.

4. Editorial policy for the department of "Questions and Discussion". *American Mathematical Monthly*, 22 (1915), 31.

5. Book review. *Plane Trigonometry, with Tables*. A. M. Harding and J. S. Turner. New York: G. P. Putnam's Sons, 1915. 158 + 51 pages. *American Mathematical Monthly*, 23 (1916), 250-252.

6. "Discussion of Courses for the Training of Teachers of Mathematics." *American Mathematical Monthly*, 23 (1916), 395-397.

7. "Algebra Courses for College Juniors and Seniors." *American Mathematical Monthly*, 24 (1917), 362-365.

8. "The number $\pi$." *American Mathematical Monthly*, 26 (1919), 209-212.

9. "Codes and Ciphers." *American Mathematical Monthly*, 26 (1919), 409-413.

10. "Student Self Government at the University of Kansas." *The Graduate Magazine**, vol. 18 (1919-1920), February 1920, no. 5, pages 123-129.

11. "Finite Geometries." *American Mathematical Monthly*, 28 (1921), 85-87.

12. Tenth regular meeting of the Kansas Section. *American Mathematical Monthly*, 32 (1925), 62-63.

13. Eleventh regular meeting of the Kansas Section. *American Mathematical Monthly*, 32 (1925), 211-213.

14. "Does Mathematics Condition Human Progress?" *The Mathematics Teacher*, 26 (1933), 296-301.

15. (with Mary Strain) "The number e." *Osiris*, Bruges, 1 (1936), 476-496.

16. "The Study and Teaching of the History of Mathematics." *National Mathematics Magazine*, 13 (1938), 22-29.

Brief Summary of Professor Mitchell's Career

Professor Mitchell devoted his life to teaching and to the service of The University of Kansas and its students, of scholarly and religious organizations, and of the community in which he lived. The nature of his career is suggested, however briefly, by the following paragraph from an article about him which appeared in *The Graduate Magazine* for January 1941 (the complete reference is given below in item 5 under "Other Biographical Accounts of Professor Mitchell").

> "U. G. Mitchell, '06, g'07, retires at this time from the chairmanship of the department of mathematics, and takes a semester leave to return next fall to continue as one of the University's finest teachers. A banquet in honor of him and Mrs. Mitchell was held Jan. 31 with nearly 200 of their friends gathered to do them honor. They may remain in Lawrence during the spring months or they may go near some other University if they can find library facilities suitable to his needs. Professor Mitchell plans to do some writing. . . . This all-around man took his undergraduate work in history and taught the subject two years at the University before doing graduate work at Kansas and at Princeton in mathematics. He is still interested in the historical aspect of numbers and of mathematics. He is the author of many learned papers and books. . . . Under a new rule department heads uniformly resign at age of 65. Professor Mitchell is 68. Dean E. B. Stouffer of the Graduate School will act as head of the mathematics department. . . . Professor Mitchell has been one of the University's most active and able

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* *The Graduate Magazine*, in recent years known as the *University of Kansas Alumni Magazine*, is published by the Alumni Association of The University of Kansas.

committeemen. Jobs that bored other good teachers have appealed to him as problems to be solved and he has carried them through patiently, loyally, efficiently. An offhand review of some of the major committees of which he has been chairman shows a total of 28, with 18 others of which he has been an active member. The astonishing list reveals a varied and potent influence on the operation of the University. Here are some of them, without any attempt at chronological order or order of importance. He has been chairman of the following committees, among others: 75th Anniversary, Commencement (10 years), University Survey (held 67 meetings over 2-year period), Red Cross, Liberty Loan and United War Work campaigns, Lindley Inaugural, Aids and Awards and several special loan and scholarship funds, Assignment of Quarters, Organization of First Operation of Memorial Union, Relationships with other Educational Institutions, Faculty Committee of School of Religion--and many others. Some of the other committees of which he has been a member include Advanced Standing, Joint Committee on Student Affairs, Publication of Science Bulletin, Selection of Chancellor in 1920, Retirement Plans, Summerfield Scholarships (secretary for 10 years)."

Other Biographical Accounts of Professor Mitchell

1. *American Men of Science*. Several editions of this biographical directory contain the biography of Professor Mitchell, in particular, the Sixth Edition (1938).

2. "U. G. Mitchell." *The Graduate Magazine*, vol. 22 (1923-1924), October 1923, no. 1, pp. 5, 30. (This is a brief account, for alumni, of Professor Mitchell's current activities in the University.)

3. "To Europe for Study." *The Graduate Magazine*, vol. 30 (1931-1932), February 1932, no. 5, p. 32. (This article describes the plans of Professor and Mrs. Mitchell to spend the spring semester of 1932 at Columbia University in New York City and the summer in Europe. He planned to attend the International Mathematical Congress in Zurich, Switzerland in September before returning to Lawrence. It was on this trip to Europe that Professor Mitchell bought many of the books in his collection of early and rare books on mathematics.)

4. "U. G. Mitchell, Genial Professor." *The Graduate Magazine*, vol. 33 (1934-1935), December 1934, no. 3, p. 8. (This article contains a photograph of Professor Mitchell and a fairly detailed summary of his life.)

5. "They Stand Out." *The Graduate Magazine*, vol. 39 (1940-1941), January 1941, no. 5, p. 4. (This article contains a photograph of Professor Mitchell and a rather detailed account of his services to the University.)

Obituary Articles

1. "Necrology: Professor U. G. Mitchell." *The Graduate Magazine*, vol. 40 (1941-1942), January 1942, no. 5, pp. 21-22. (This article contains a photograph of Professor Mitchell, an account of his death on January 1, 1942, and much information about his life and his activities in the University.)

2. "U. G. Mitchell, 1872-1942." By G. Waldo Dunnington. *National Mathematics Magazine*, 16 (1941-1942), 240-242.

2. Letter from U. G. Mitchell to Chancellor Frank Strong, April 13, 1903

Lyons, Kansas, April 13th 1903.

Chancellor Frank Strong,
Lawrence, Kansas.

Dear Sir:-

You probably can not recall my face, although I met you at the City Superintendent's Round Table during our K.S.T.A. meeting in Topeka last winter. I therefore enclose a picture clipped from the February number of "The Kansas Educator" to give you some notion of what I look like.

I am encouraged to write to you and present the matter I have in mind by a conversation and some correspondence I have had with Hon. T. M. Potter of Peabody, a regent of the University and a friend who has been personally acquainted with me for more than fifteen years. He has assured me that I will not find you a hard man to approach and that I may refer you to him most freely. I shall try to be as brief as possible, for from my own busy life I can realize something of the multiplicity of such calls upon your attention and of weightier matters that press upon your time.

In universities there is usually a limited number of assistants chosen from the student body to do some of the lighter teaching in the various departments. I believe that they are generally chosen from the graduate school, but that it is not necessarily so and that exceptions are sometimes made. If I could get such a position at K.U. which would employ a part of my time and pay enough to insure part of my expenses while I carried on my own studies I would give up my position here and take it.

I had understood that there was such an assistant in the department of education and had thought I might be able to find an opening there, since my Normal School training and ten year's experience in teaching would probably enable me to do some of the work satisfactorily. Take, for example, School Law. Besides a ten weeks course upon the subject itself, I have had a year's work upon the general subject of law, including work upon Blackstone, Cooley and others. I had good courses in the so-called professional subjects, and when I took the examination for a state certificate I made a grade of 99% in Philosophy of Education and a grade of 98% in History of Education. I expect to take work in that department whenever I come to the University (as I intend to do some day whether I work there or not) and had thought myself best fitted for assisting in that department. However, I saw Prof. Olin at Topeka and had a few minute's talk with him upon the subject and he suggested that I might perhaps get a place in the department of mathematics teaching college algebra and trigonometry. I have always done my best work in mathematics, although I have only gone to analytics. I took trigonometry (plane and solid) in the University of Nebraska. Have had no experience in teaching it in regular school-work but have given private instruction in both that subject and the college algebra. I feel sure that with the careful preparation I would make that I could teach both satisfactorily. My experience in teaching geometry and higher algebra would certainly strengthen me for it.

I was graduated from the Peabody (Kansas) High-school in 1892 with highest honors in a class of fifteen members, having made a general average of 98 3/13% for the three year's course. I attended the University of Nebraska in '95-6, taking among other things Anglo-Saxon under Dean Sherman. In 1898 I was graduated from the Pedagogical (Classical) course of the Central Normal College of Great Bend. That was the next year after Supt. Stryker left the school and its standing was all right. That same year I was granted a State certificate by the State Board of Education, and in 1901 a life certificate.

I am thirty years old and have as good a wife and as happy a home as the sun often shines upon. I am determined to get a better education and shall go on to school as soon as I can save up enough to insure me support for a year or two ahead. My father died while I was yet a boy and I have been taking care of myself and helping others of my family ever since I was fifteen years old and I have learned to count the cost and search for ways and means. My work here has proved pleasant and I have been given assurances that I can stay here with an increase in salary if I so desire; but I realize that I am growing older and I am anxious to go on as soon as possible. I have some money saved for that purpose, but would not feel safe in venturing to start this year unless I can get some work to pay part of my expenses.

I have written you a full and frank statement as Mr. Potter advised me to do. If you can do anything to help me along I assure you that your kindness will be gratefully received. If you can not, I shall feel sure that it will not be for lack of generous and sympathetic impulse on your part.

I shall enclose two or three recommendations and would like to have you return them with your reply.

Trusting that I may hear from you as soon as your convenience will permit, I am,

Yours Respectfully,

/s/ U. G. Mitchell

3. Letter from Chancellor Frank Strong to U. G. Mitchell, April 17, 1903

April 17, 1903.

Supt. U. G. Mitchell

Lyons, Kansas.

My dear Supt. Mitchell: Your favor of April 13 in regard to a position here was duly received. Your application will be placed on file and given due consideration. I return herewith your recommendations which are evidently originals and should be kept in your posession [sic].

With best wishes, I am

Very truly yours,

Chancellor.

Appendix V

"Reminiscences of a Mathematical Immigrant in the United States"

by Solomon Lefschetz

From the *American Mathematical Monthly*,

vol. 77 (1970), no. 4, April, pp. 344-350

"Reminiscences of a Mathematical Immigrant in the United States"

by Solomon Lefschetz, Princeton University and Brown University

My career as mathematical immigrant began in 1911 upon my receiving the Ph.D. degree from Clark University (Worcester, Mass.). While small, Clark had as its President G. Stanley Hall, an outstanding psychologist, and several distinguished professors. The mathematical faculty consisted of three members: W. E. Story, senior professor (higher plane curves, invariant theory); Henry Taber (complex analysis, hypercomplex number systems); De Perrott (number theory).

There were great advantages for me at Clark. I graduated from the *École Centrale* (Paris) (one of the French "*Grandes Écoles*") in 1905, and for six years was an engineer. I soon realized that my true path was not engineering but mathematics. At the *École Centrale* there were two Professors of Mathematics: Émile Picard and Paul Appel, both world authorities. Each had written a three-volume treatise: *Analysis* (Picard) and *Analytical Mechanics* (Appel). I plunged into these and gave myself a self-taught graduate course. What with a strong French training in the equivalent of an undergraduate course, I was all set.

To return to Clark, I soon obtained a research topic from Professor Story: to find information about the largest number of cusps that a plane curve of given degree may possess. An original contribution which I made secured my Ph.D. thesis and my doctorate in 1911.

At Clark there was fortunately a first rate librarian, Dr. L. N. Wilson, and a well-kept mathematical library. Just two of us enjoyed it--my fellow graduate student in mathematics and future wife, and myself. I took advantage of the library to learn about a number of highly interesting new fields, notably about the superb Italian school of algebraic geometry.

My first position was an assistantship at the University of Nebraska (Lincoln), soon transformed into a regular instructorship. This meant my first contact with a regular midwestern American institution and I enjoyed it to the full. I owed it mainly to the very pleasant and attractive head of the department, Dean Davis of the College. The teaching load, while heavy, did not overwhelm me since it was confined to freshman and sophomore work.

Not too many weeks after my arrival, the Dean got me to speak before a group of teachers in Omaha on "Solutions of algebraic equations of higher degree." And then and there I learned an all-important lesson. For I spoke three quarters of an hour--three times my allotted time! When I found this out some weeks later from the Dean, my horror knew no bound. I decided "never again," to which I have most strictly adhered ever since.

A second lesson was of another nature. I utilized my considerable spare time in reading Hilbert's recent papers on integral equations. At Clark I had also read Fredholm's Acta paper on the same topic and my enthusiasm for integral equations was very great. I offered to lecture on Hilbert's work in my fourth term and this was accepted. Consequence: a very heavy teaching load for two students who I fear were quite bewildered. One of them, Oliver Gish, a graduate student in physics (later a distinguished geophysicist) remained my lifelong friend. I also formed a close friendship with his mentor and a capable mathematician, Professor L. B. Tuckerman (later of the Bureau of Standards).

The course taught me a valuable lesson: the experience generally absorbs too much energy. I have since expressed this opinion to many a recent doctor, but I fear that few heeded it.

My two years in Nebraska made me realize a widespread feature of American institutions of higher learning which were State institutions. By general state rule they had to accept any graduate from an accredited high school. Consequence: in the freshman year a flood of very poorly prepared students and a large number of sections, especially in the first term. By the end of the first year the entrance flood was reduced to half; the sophomore sections--in mathematics at least--were in much smaller number, more readily handled and better taught. This went on down to the last year, with the flood in mathematics reduced to 10-15 or so (mostly girls) and the total number of graduates much smaller than at entrance.

Lincoln, the capital of the State (population about 50,000) was a very pleasant city, with a distinct urban flavor. It was not too far from Omaha, the major city of the State. Most family houses were surrounded by a small garden and the whole made a very good impression. The University was at one end of town; the Agricultural College, part of the University (pet of the very rural Board of Regents), at the other end. There were a couple of small colleges situated in Lincoln.

At the end of two years (1913) a larger offer, plus my approaching marriage to my Clark fellow student, made me accept an instructorship at the University of Kansas in Lawrence. The teaching conditions there were the same as in Lincoln, but with a slightly smaller load. At the University of Kansas the department was divided into two groups; college plus graduate work and engineering. I was assigned to the latter. While the students were somewhat more purposeful, the preparation was equally weak in both parts.

Lawrence (population 12,000) had a rather severe New England tradition. Except for the University with about 3000 students, it was really a most pleasant rural community. The University was on top of quite a hill, with well-constructed and mostly recent buildings. The view from the top was exceptionally attractive.

The major city near by was Kansas City. Lawrence was about 25 miles from Topeka (the capital), while Kansas City was 50 miles away. This was all before the automobile age and my friends and I indulged in many country walks.

The general entrance preparation in Lawrence and Lincoln was so feeble that early teaching could only be technical and deprived of theory. As the freshman flood eroded, this situation improved somewhat.

The rule in Lawrnce for beginning faculty members was three years in each position and it was rather rigidly enforced. The situation did not seem perfect--far from it. However, I discovered in myself, first a total lack of desire to "reform" coupled with a large adaptive capacity. At Lawrence I only cooperated with a colleague in driving out several unattractive texts, notably Granville's Calculus, for which my taste was $<\epsilon$.

Years later I inquired of Professor Lusin (Moscow) why the Soviet mathematicians translated Granville. Reply: "We only took his excellent collection of problems, but provided our own theory." This may explain our efforts to move this book out of Kansas.

At this place I was prepared to indulge in extensive criticism, at least of the midwestern system. The fact is, however, that in both Nebraska and Kansas I found good and well-kept mathematical libraries, ample at least for my own purposes. Moreover, I came to realize the enormous advantage over the European system: it provided uncountably many opportunities for younger research men with ideas to grow and develop their powers, as instructors for example, with ample leisure. For the teaching loads, while considerable, were not really intolerable. Moreover, they generally went with colleagues who had other interests, mathematical or administrative, but not intent upon imposing on one uncongenial mathematical interests. At all events, in my case, it turned out to be of great value. Needless to say, special research favors were rare indeed.

In spite of the general level, I had in Lawrence three or four excellent students. One of them, Warren Mason, went to work for Bell Laboratories in New York (later near Elizabeth, N. J.), took his Ph.D. in physics at Columbia, and at Bell became a top specialist in the theory of sound and its applications. I am very proud of him. Still another strong student, Clarence Lynn, joined forces with Westinghouse in Pittsburgh (electrical department) and was most successful there.

I have found that in freshman courses in mathematics, and less so in the next year, hardly one third of the students care for and are not totally bored by mathematics. Hence at that early level a teacher must be exceptionally lively and have a sympathetic understanding of the students. Needless to say this must be coupled with a complete grasp of the topic taught.

Here are a few very radical suggestions for later years. From the junior year on through graduate work they should be merged into a professional school, with teaching, at least in mathematics, of seminar type plus abundant but easy contact with faculty on an individual basis. In other words "baby talk" should end with sophomore years.

The guidelines in my research were: Picard-Simart: *Fonctions algébriques de deux variables* (two volumes, mostly Picard); Poincaré's papers on topology (=analysis situs) and on algebraic surfaces; Severi's two papers on the theory of the base; Scorza's major paper (dated 1915) in *Circole di Palermo* on Riemann matrices.

Around 1915 and for a long time, a certain result of Picard baffled me. Let $H$ be a hyperelliptic surface. Direct calculation yielded: the Betti number $R_2(H)=6$. Picard, however, appeared to give its value as 5. The discovery of the missing link played a major role for me. Namely, Picard only wanted $R_2$ for the *finite* part of $H$, neglecting the curve $C$ *at infinity*. *Hence* $C$ *was a 2-cycle*, and so was any algebraic curve! This launched me into Poincaré-type topology, the 1919 Bordin Prize of the Paris Academy and in 1924 Princeton! (The translated prize paper appeared in the Trans. Amer. Math. Soc., vol. 22, 1921.)

The immediate effect of the Prize was the Kansas promotion (January 1920) to Associate Professor plus a schedule reduction. Also (1923) there came a promotion to a Full Professorship. I spent the year 1920-21 in Europe, half in Paris, half in Rome. I gathered little mathematical profit in Europe; some from the summer of 1921 which I spent in Chicago.

About Paris I particularly remember an interview with Émile Borel lasting five minutes in which I offered to write for his Series my future monograph *L'Analysis Situs et la Géométrie Algébrique*. He accepted at once! (In such matters our "speedy" country knew no such speed.) Proof sheets, etc., were dealt with rapidly and not a syllable was changed.

I come now to my Princeton period. In 1923 an invitation came from Dean Fine, the Chairman of the Department of Mathematics and Dean of the Faculty at Princeton, to spend the following year there as Visiting Professor of Mathematics. Dean Fine was the long-time head of the department and the true founder of what became an outstanding department of the University. With reason, upon the construction of the mathematical building it was called "Fine Hall." (Dean Fine was killed in an automobile accident just before Christmas 1928 and his lifelong friend, Mr. Thomas D. Jones, immediately granted $600,000 as a memorial to Dean Fine for a new mathematics building.)

Well, upon receiving Dean Fine's invitation, I accepted. For the following year I received a permanent offer to stay at Princeton as Associate Professor. This was changed 18 months later (January 1927) to a Full Professorship and

January 1932 to a Research Professorship (Fine professorship) as successor to Oswald Veblen. In this position I had no assigned duties whatever.

At Princeton I found myself in a world-renowned University and in one of its outstanding Departments. Among the great mathematical Professors there were: Eisenhart, Veblen, Wedderburn, Alexander, Hille. I was in closest contact with Alexander--a top authority in topology.

My joining the Princeton faculty coincided with a definite change of direction in my research from the applications of nascent topology to algebraic geometry (*vide* my prize paper) to a pure topological problem: coincidences and fixed points of transformations. For this problem I invented a completely new method of attack, which by 1925 culminated in a well-known fixed point expression $\phi(f)$, $f$ a mapping of a manifold into itself, that said: $\phi\neq 0$ implies that $f$ has fixed points; if $f$ has none, $\phi=0$. The preparation and extensions required occupied me for several years. One of my early graduate students, A. W. Tucker, an outstanding Princeton mathematician, found the way to a far simpler method than my early one, which I have accepted *in toto*.

Much of my Princeton teaching, until 1930, was still freshman-sophomore. However the students, selected with care at entrance, were much better prepared than in the midwest. The contrast of the systems was very great.

*Princeton system:* A strictly private school, with limited funds and space, could not accept all comers. Hence it had, unavoidably, to fix the number of admissions, utilize a strict selection, and keep the admitted men practically through the four collegiate years. The same system, in some form, was also applied to admission to the Graduate School.

*Midwestern system:* As I already stated, they had to admit all duly certified high school students. The freshman entrance flood resulted in teaching mostly by graduate students, many of uncertain quality.

The Princeton system had two important consequences. First, it enabled one to organize preferred sections even before entrance. Second, courses could be initiated at a more advanced stage and proceed more speedily. Thus algebra and trigonometry were done each in two weeks, analytical geometry in five weeks, calculus started in the second freshman semester (in Kansas-Nebraska in the sophomore year).

Some years later, good students from strong preparatory schools or high grade secondary schools (where they already had those subjects) were allowed to skip, even the whole first year. Moreover, such A-1 men (not many) were soon treated like graduate students, allowed to participate in advanced seminars and thus to become well acquainted with the members of the mathematical faculty.

The Princeton aim was decidely different from the Nebraska-Kansas aim. The latter had to provide for a considerable number of teachers in their states, to form moderate level technicians of all kinds, sending a very few of the best for better training to major eastern institutions. Princeton on the contrary was planned to form the top echelons, notably in the sciences. This meant aiming first for the doctorate. In mathematics it soon became customary to retain the best men for at least one year after the Ph.D. on some fellowship or in some teaching position with very light duties. A number of the men so developed occupy today major posts in outstanding institutions.

In 1932 a major change took place through the establishment at Princeton of the Institute for Advanced Study, with mathematics as its first and strongest group. This resulted in the migration of three of our major members: Veblen, Alexander and von Neumann.

The basic effect on me was regaining the mathematical calm of Nebraska-Kansas, which I had so enjoyed without realizing it. Our mathematics chairman, Dean L. P. Eisenhart, with the unstated motto "live and let live" had much to do with this return of calm. During this period my mathematical work progressed. My first Topology treatise (1930) appeared and was many times approved by friendly colleagues. A second Algebraic Topology appeared in 1942, rather less satisfactory, because too algebraic. Other books came. I was editor of the *Annals of Mathematics*, which grew to occupy an A-1 place in mathematics, but did not overwhelm me with work. Then came World War II and I turned my attention to Differential Equations. With Office of Naval Research backing (1946-1955) I conducted a seminar on the subject from which there emanated a number of really capable fellows, also a book: *Differential Equations, Geometric Theory* (1957).

When Dean Eisenhart retired (1945) I succeeded him as Chairman, until my own retirement in 1953.

In 1944 I joined as a part-time connection the *Instituto de Mathematicas* at the National University of Mexico. This continued until 1966. At the *Instituto* I was as free as under my Princeton professorship. I conducted seminars in topology and differential equations, gave a couple of times a "volunteer" course on "general mathematical concepts" directed at beginners and, thanks to a good working library, was able to continue research. Conditions were of course quite different from ours, but as I became rapidly fluent in Spanish, it gave me many advantages. Through the years I found quite a number of capable young men, several of whom I directed to Princeton for further advanced training up to the doctorate and later. Among them I may mention Dr. José Adem, Chairman of the Department of Mathematics of the newly founded *Centro de Estudios Avanzados* in Mexico City.

My long connection with Mexico has been the occasion of many side trips (especially in connection with meetings of the Mexican Mathematical Society), so that I have a fair acquaintance with that wonderful country.

In 1964 the rarely awarded order of the Aztec Eagle was conferred upon me by the government of Mexico.

My work as Russian reviewer for differential equations had made me aware of our lag relative to the Soviets in this all important field in all sorts of applications. The arrival of Sputnik in 1957 convinced me that this lag had to be remedied. As I attributed it to our scattered efforts, I came to the conviction that the only remedy was to establish a Center for study and research in differential equations.

From Dr. Robert Bass, formerly a member of my project, I learned of the formation in Baltimore, as a division of the Martin Aircraft Company, of a new Research Institute for Advanced Study (RIAS) under the direction of Welcome Bender, a graduate of MIT and long time Martin engineer. When I approached him with my (modest) plans he was enthusiastic. In a few days I was entrusted with the formation of a group of say five top men and about ten younger associates, with myself as director. Suffice it to say that I had considerable success. I first was able to obtain the cooperation of Prof. Lamberto Cesari of Purdue, one of the major specialists anywhere; also of Notre Dame, Prof. J. P. Lasalle as my second in command (my best appointment) and complete the group with Dr. J. K. Hale of Purdue (Cesari's best student there) and Dr. Rudolph Kalman of Columbia (an electrical engineer coupled with good mathematics). My strong basic group was thus complete.

I demanded (and obtained) from Mr. Bender that my group operate under standard university conditions.

Very shortly we became known. A considerable number of the good differential-equationists visited us, and some few were invited for a year or so.

After some six years it was necessary to transfer our Center elsewhere. This operation, carried by Lasalle, resulted in our becoming part of the Division of Applied Mathematics at Brown University as "Center for dynamical systems" with Lasalle as Director and myself as (once weekly) Visiting Professor. At Brown our general relationship has been excellent. A year or so ago the Director of the Division died and was succeeded by Lasalle whose general performance could not be excelled.

In conclusion I must recognize a budget of debts which I may never succeed in liquidating to the full.

The first is my enormous debt to my wife Alice, my Clark companion. Without her constant and unfailing encouragement through 59 years, 56 as my wife, I would have long since ceased to operate. . . .

Second major debt: to the United States, which through their (however imperfectly organized) universities made it possible for me to follow my deep bent for mathematics. I should also include here the contribution of the National University of Mexico from 1944 to 1965--years after my Princeton retirement, and also of RIAS and Brown.

In this long and agreeable route of 57 years I encountered so many *simpáticos amigos* that to name them all would be impossible. May they one and all accept my fervent *gracias* for my debt to them. I hope that they have felt that it was not incurred in vain.

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Prof. Lefschetz continues an astonishingly productive career. His profound influence in the development of topology and of algebraic geometry is expounded at length in articles by W. V. D. Hodge and Norman E. Steenrod in the Princeton Symposium volume in honor of S. Lefschetz, *Algebraic Geometry and*

*Topology* (1957) edited by R. H. Fox, D. C. Spencer, and A. W. Tucker. His numerous publications in these fields include the books, *L'Analyse Situs et la Géométrie Algébrique* (1924), *Géométrie sur les Surfaces et les Variétés Algébriques* (1929), *Topology* (1930), *Algebraic Topology* (1942), *Topics in Topology* (1942), *Introduction to Topology* (1949), and *Algebraic Geometry* (1953). In recent years he has produced fundamental research in ordinary differential equations, including the volumes *Differential Equations, Geometric Theory* (1957), and (with J. La Salle) *Stability by Liapunov's Direct Method with Applications* (1961).

Prof. Lefschetz began his mathematical career in 1911 with his PhD under W. E. Story at Clark University. He held positions at the Univ. of Nebraska, Univ. of Kansas, then Princeton University until his retirement. At Princeton he was Research Professor, 1932-1953, and Department Chairman, 1945-1953. Since, he has been at the National University of Mexico, RIAS, and Brown University. His numerous awards include the Bordin Prize (Académie des Sciences 1919), the Bôcher Prize (AMS 1924), the Feltrinelli Prize (Academia dei Lincei 1956), and foreign memberships in the Royal Society and the Académie des Sciences. He was Editor, Annals of Mathematics, President AMS (1935-1937), and is a member of the National Academy of Sciences and the American Philosophical Society. *Editor*.

## Appendix VI

## Dean Ellis B. Stouffer

## 1884-1965

1. Ellis Bagley Stouffer, 1884-1965, by G. Baley Price

Dean E. B. Stouffer was born on November 7, 1884, in Melbourne, Iowa. He received B.S. and M.S. degrees from Drake University in Des Moines in 1907 and an LL.D. degree in 1931. He taught at Drake University for one year following his graduation there and then began graduate work in mathematics at the University of Illinois in 1908. He received his Ph.D. degree in 1911, and his thesis, written under the supervision of E. J. Wilczynski, was published as a forty-page paper in the *Proceedings of the London Mathematical Society*. He spent the years 1911-1914 as an instructor at the University of Illinois before coming to The University of Kansas in 1914.

Chancellor Emeritus Raymond Nichols has written, "Over a period of more than forty years Ellis Stouffer contributed his varied talents to the development of The University of Kansas--as teacher, as scientist, as administrator". These contributions are described in detail in the five papers which follow in this appendix; the first four of these were read at a memorial service held on November 30, 1965, and the fifth was read by Mr. Nichols at the opening of the E. B. Stouffer Conference in Mathematics on October 24, 1974.

Dean Stouffer was one of the giants who helped to make the University great. In remembrance of his contributions, the Department of Mathematics and others in the University joined in having his portrait painted; it hangs now in the office of the Graduate School. The University named Stouffer Place, which contains apartments for married students, in Dean Stouffer's honor, and the streets Ellis, Bagley, and Anna in Stouffer Place are named for Ellis Bagley Stouffer and his wife Anna.

Mrs. Stouffer was Anna L. Shepard; she and Dean Stouffer were married on August 11, 1915. Throughout their long and happy life together, she engaged in university and community activities and supported him in his arduous assignments. Their daughter, Miss Jean Stouffer, was Associate Dean of Students and Foreign Student Adviser at Fort Hays Kansas State College; she died there on June 2, 1976. The E. B. Stouffer Professorship in Mathematics was established by Miss Stouffer in memory of her father; the first E. B. Stouffer Professor was G. Baley Price, in 1974-1975. The Stouffer Professorship is the first named professorship established on the Lawrence campus of the University in honor of a member of the faculty.

Dean Stouffer retired from active service in 1955; he died in Lawrence on November 24, 1965. Mrs. Stouffer outlived her husband by about six months.

2. Papers Read at the Memorial Service for Dean Ellis B. Stouffer, November 30, 1965

Appreciation of Ellis B. Stouffer

by Raymond Nichols

The stature of an institution, we are told, is measured by the collective impact of the leaders with which it has been blessed. As the University of Kansas nears the end of its first century we realize that many individuals have contributed to the stature that the University now enjoys. In my personal judgment, which is shared by many people, the man whose memory we honor today made a major impact on this development.

Over a period of more than 40 years Ellis Stouffer contributed his varied talents to the development of the University of Kansas--as teacher, as scientist, as administrator. In a quiet unobtrusive way he gave of his energies and abilities in a measure probably unequaled by any other faculty member in the history of the University.

His major contribution came through his chairmanship of the University Budget Committee over a period of more than twenty years ending in 1950.

Parenthetically, it should be explained that the Budget Committee (of four members) was advisory to the Chancellor on all budget matters and was charged each spring with making detailed recommendations on the budget for the following year based on a conference with each department or office.

In my service as secretary of the committee during most of this period I was privileged to observe Mr. Stouffer's effective operations--his quiet, but forceful presence; his insistence on having all the facts on any issue, and his objectivity in evaluating these facts; his intense loyalty to and support of the faculty, but his requirement of a full measure of effort; his uncanny ability to distinguish fact from fiction in a request, but his absolute fairness in weighing such a request.

Although the Budget Committee achieved a high degree of agreement on budget matters, there were occasions on which difficult problems emerged, followed by long and inconclusive discussions. At a point at which a solution seemed impossible and the other members of the committee were ready to adjourn for the day, Mr. Stouffer so often quietly suggested a new approach. I can see him now in my mind's eye, looking up after a period of concentration to say, "What would you think of this?" or, "I wonder if this would work." His suggestion usually was either the obvious answer to the problem or it prompted discussion which soon led to an acceptable solution. This sort of situation happened so many times that it appeared that Mr. Stouffer had some special insight into administrative problems.

Mr. Stouffer's leadership qualities as budget chairman were put to their severest test in the 1930's when the University literally struggled for survival during and immediately after the Great Depression. Legislative support built back very slowly after the heavy budget reductions of 1930-1932, lagging far behind the level of restoration enjoyed in other states. For several years there was little money for salary increases, for new positions, for scientific equipment, for travel, or for library books, and the University literally was unable to compete in the academic market place. Morale was low and some people lost hope. Under the leadership of Mr. Stouffer the University somehow managed to spread its meager resources effectively enough to maintain its dignity and its accreditation until the good years again returned. Under leadership with lesser imagination and determination the University easily could have suffered a slump in which it might still be floundering.

For Mr. Stouffer's leadership during those difficult days the University forever will be indebted. His loyalty and dedication made possible the high standing the University enjoys today and the hope we all cherish for its approach to greatness in the second century. He was a giant in our midst.

## Memorial Service for Ellis B. Stouffer

by John H. Nelson

Not long after coming to the University of Kansas in the fall of 1925 I became aware of a particular kind of excellence found in the Graduate School here. Although small at the time and in command of only limited scholarship funds, it was uncommonly active, particularly in dealing with the anomalous situation of the student who, while only a few steps away from the baccalaureate program, was already considered to be too advanced to need any general advice. Attempts were being made to show such a student that there were others beside his departmental adviser and his professors who had his welfare at heart. He was invited to drop by the Graduate Office for a visit. The advantages of belonging to the entire academic community, instead of to only a segment of it, were called to his attention. All this was understandable after I had come to know better the Dean of the School, Ellis B. Stouffer. Dean Stouffer did not wish to see his office become primarily a record-keeping center, as many such offices were. He preferred to deal directly with individual students, not indirectly with them through rules and regulations. For two and a half decades he was able to steer clear of the twin pitfalls of graduate divisions, namely, bureaucratic practices and bureaucratic control.

Much of his success in this and in other ways was owing to the breadth of his experience. Over a period of twenty years and more Dean Stouffer was active in the affairs of the Association of American Universities, which in his day was an organization controlled by and for the use of the directors of graduate study in the thirty principal universities of the United States and Canada. From 1940 through 1944 (as I recall) he was Secretary of the Association; and he was the first secretary in the then forty-year history of the organization who did not come from one of the large and prestigious American Universities. As the one permanent, so-called, or "working," official he was responsible not only for keeping records, overseeing the publication of the *Transactions*, and collecting dues, but also for arranging the program for the annual meeting, issuing invitations to honored guests, and carrying out a mass of routine business during the academic year. He served on numerous committees and was one of the regular inspectors of colleges for the Association, helping in this way to keep up-to-date the once noted AAU list of accredited undergraduate institutions in the United States. When the Association undertook to investigate the controversial problem of the M.A. program in the hope of restoring it to its once strong position, Dean Stouffer was asked to do the job. His report, and an article based on that report, came to be widely regarded as the "authoritative" discussion of the subject. For years the article was referred to in educational literature, and was used to establish guide lines by the north Central Association in its pioneer attempt to evaluate graduate work. In a very true sense Dean Stouffer was a national leader, one of ten or twelve such leaders, in the field of graduate education just before and during the Second World War.

But it was, after all, on his home campus that his most important work was done--not only as head of the Graduate School, but also as a scholar, teacher, Chairman of the Department of Mathematics, Dean of the University, and Chairman of the Budget Committee. He left his imprint on the University of Kansas in a number of ways. That we have in force today, as we believe, standards of scholastic excellence, as well as harmonious relationships among faculty and administrative groups, is owing in no small measure to the labors of Ellis Stouffer.

His work was, and is, a reflection of the man himself--a man of rare sensibilities and noteworthy judgment, who well knew what a university should be and the directions in which it should move. By reason of his personal qualifications he was unusually well suited for university administration. Who that knew him can forget his firm but kindly manner of carrying out his duties, his ability to project himself into the situation of another person, his shrewdness of observation, his skill in evaluating men, the patience with which he considered all facets of a problem before reaching a conclusion, and his great generosity of spirit? If, a Mathew Arnold once suggested, humanity in general disappoints us by reason of its manifold imperfections, we can still be heartened from time to time by the appearance of an individual who is the exception--one in whom we find united the strengths of moral courage, compassion, good judgment, self-control, the understanding mind, informed idealism, and the full employment of all his talents.

Such an individual was Ellis Stouffer. To have known him was a great privilege; this, I know, is the feeling of all of us who worked closely with him and were his friends.

## The Mathematical Work of Dean Ellis Bagley Stouffer

by G. Baley Price

Dean Stouffer participated in the dramatic developments which accompanied the rise, during his lifetime, of mathematics in the United States from nothing to a position of preëminence in the world. Research in mathematics developed late in the United States, and, indeed, Benjamin Peirce (who died in 1880), Josiah Willard Gibbs (who died in 1903), and George William Hill (who died in 1913) are considered the only mathematicians in America who made significant contributions before the last decade of the nineteenth century. Nevertheless, there began in the 1890's a great surge of activity which carried American mathematics to a position of world leadership by the beginning of World War II.

When Dean Stouffer was born in 1884, there was not even a professional organization in the field of mathematics in the United States. The New York Mathematical Society was founded in 1888; it became the American Mathematical Society in 1894 in response to the rapid growth in its membership outside New York City. A strong center of mathematical research was established at the University of Chicago when it opened in 1892, and this event led in turn to the establishment of the Chicago Section of the American Mathematical Society in 1896. The San Francisco Section of the Society was established in 1902, and the Southwestern Section--with strong support from the mathematicians at Washington University and the Universities of Kansas and Missouri--was established in 1906.

When Dean Stouffer came to The University of Kansas in 1914, he joined a Department that had already established a reputation for its good work in mathematics. Chancellor Snow was the first to teach mathematics at KU, but he was soon followed by mathematicians who formed the Department of Mathematics. The record shows that Henry Byron Newson of this Department attended the meeting in Chicago in 1896 at which the Chicago Section of the American Mathematical Society was organized. Solomon Lefschetz, who has gained world renown for his mathematical researches, joined the KU Department in 1913. Finally, Dean Stouffer was appointed an Assistant Professor in the Department in 1914.

Dean Stouffer received his B.S. and M.S. degrees from Drake University in 1907, taught there the following year, and then began graduate work in mathematics at the University of Illinois in 1908. He received his Ph.D. degree in 1911, and his thesis--written under the supervision of E. J. Wilczynski--was published as a forty-page paper in the *Proceedings of the London Mathematical Society*. He spent the years 1911-1914 as an Instructor at the University of Illinois before coming to The University of Kansas in 1914.

Dean Stouffer contributed to mathematics through his published research and through his service to mathematical organizations. From 1911 through 1932 he published a total of twenty research papers in the *Proceedings of the London Mathematical Society*, the *American Mathematical Monthly*, the *Kansas University Science Bulletin*, the *Proceedings of the National Academy of Sciences*, the *Bulletin of the American Mathematical Society*, the *Transactions of the American Mathematical Society*, and the *Proceedings of the International Congresses of Mathematicians* (Bologna, 1928; Zurich, 1932). Dean Stouffer was awarded a Guggenheim Fellowship and spent the year 1926-1927 in research in Bologna, Italy. He attended the International Congresses of Mathematicians held at Bologna in 1928, at Zurich in 1932, and at Harvard University in 1950; he presented papers at the first two of these Congresses. Three students (Florence Black, Wealthy Babcock, and R. G. Smith) wrote their Ph.D. dissertations under his supervision.

Dean Stouffer served mathematics in many positions. He was Secretary of the Southwestern Section of the American Mathematical Society for seven years (1921-1925 and 1927-1928). He served three years as a member of the Council of the American Mathematical Society (1926-1928). For nearly four years (1926-1929) he was an Associate Editor of the *Transactions of the American Mathematical Society*. His service to mathematics did not stop when his publications ceased in 1932. He served one year (1933) as Vice President of the Mathematical Association of America and two years (1936-1937) as Vice President of the American Mathematical Society. Finally, he was Editor of the *Bulletin of the American Mathematical Society* for six years (1945-1950). It was for this reason that the oil portrait of Dean Stouffer which was painted in 1950 when he retired as Dean of the University showed, at the request of the Department of Mathematics, a volume of the *Bulletin of the American Mathematical Society* lying on his desk.

Mathematics was fortunate to have in its early days not only research mathematicians but also mathematicians who were respected and honored for their sound judgment, wise counsel, and effectiveness as administrators. Some of these became department chairmen, deans, and university administrators. Dean Stouffer was a member of this group. He served The University of Kansas in a variety of administrative positions from 1922 to 1950; furthermore, he was Chairman of the Department of Mathematics from 1942 until his appointment as Dean of the University in 1946. Another member of this group of devoted administrators--and one of Dean Stouffer's best friends--was R. G. D. Richardson, Dean of the Graduate School of Brown University and for twenty years (1921-1940) Secretary of the American Mathematical Society.

Dean Stouffer was honored by his colleagues for his work in mathematics. On three occasions he delivered invited addresses on his research. To indicate the important position he held in mathematics in the United States, he was starred in the fourth edition of *American Men of Science* (1927).

Dean Stouffer was one of the nation's pioneers. During his lifetime, mathematics in the United States developed from nothing to a position of preëminence in the world. He contributed to this development both at The University of Kansas and in the nation as a whole.

The greatness of a university is measured by the stature of its faculty. Dean Stouffer, as a research scholar and editor, contributed to the development of mathematics in the United States. As a teacher, Chairman of the Department of Mathematics, and administrator, he contributed to the development of The University of Kansas. He was a gentleman and a scholar. The University of Kansas mourns the passing of one of its finest.

Memorial Service for Ellis Stouffer

by George B. Smith

To summarize in any detail the major points made by my friends seems to me to be unnecessary. They have outlined in different ways and with different illustrations what all of us know--that as in the physical world where everything has length, breadth and depth,--so in the personal world, the life of any man is measured by these same dimensions. The life of Ellis Stouffer richly illustrates this fact.

As I wrote these remarks, I was seated at his desk in my office. This statement perhaps needs some explanation. Upon the retirement of Dean Stouffer from administrative duties I had the high honor of following him, after the space of several months, in his last administrative assignment at the University of Kansas. When I moved into his office I was tempted, but not for long, to order a new desk, almost a ritual in some organizations. There were two reasons why I did not do so. The minor reason was based on my feeling that Ellis Stouffer was looking over my shoulder, his office was just down the hall some two hundred yards away. When one gets that feeling one does not make unnecessary purchases, at least not out of state funds. Parenthetically, I should say, that this is no isolated example of his continuing control in fiscal and academic matters small and large, from that day thirteen years ago up to today, and for me, through today into the future.

In reality, I kept that desk, I freely admit, for a reason far more sentimental than practical. It has been a daily reminder of the real and significant contributions made by Ellis Stouffer to the University of Kansas, and to me personally. I am reminded each day of his broad and deep knowledge of University affairs and of his long and dedicated service. I am reminded, too, of his unselfishness and his dedication to his position, no matter in what position he might be serving at the time, at the University, here in Plymouth Church or anywhere else.

But above all, I remember how he shared his knowledge and his love of objectivity and facts with a young and untried fellow who was trying desperately to fill his very large shoes.

I intend to use the desk of Ellis Stouffer in my office as long as I remain in my administrative role. I hope the administrative officials will allow me to move it with my belongings when I return to teaching for I am sure that the inspiration I receive from these memories will help me wherever I may be.

Not all memories of Ellis Stouffer are in the "work world". Two isolated instances will serve to highlight his ability to combine a long life of administrative responsibility with warmth and human understanding. First, an incident which occurred prior to my arrival in Lawrence. It was during his golfing days. There had been a particularly heated argument during an early afternoon budget meeting, so my informant reports, between Ellis Stouffer and one of the deans, now no longer at the University of Kansas. It was over basic academic policy and Ellis Stouffer and the dean were both defending their opposing points of view with vim and vigor. After the final decision, and I assume, if the situation was normal, that the point of view held by Ellis Stouffer triumphed, the two antogonists walked out of the office arm in arm on the way to the Country Club for their scheduled golf game. A member of the foresome related this story to me and reported that the two long-time friends, while differing strongly on academic matters, never once let those differences interfere with their respect for each other or their deep friendship.

The other incident also occurred prior to my arrival in Lawrence. In fact, it happened on his fiftieth birthday. The students in one of his mathematics classes, though being a little fearful of his "all business" attitude in the classroom, and his well-known dedication to the principle of never allowing anything, I repeat, anything, to interfere with the major educational effort, decided that this well-loved professor should have a birthday cake. So with fear and trembling one of the students, at the opening of the class, presented Ellis Stouffer with a cake, complete with candles lighted. All of the students waited for the world to fall in upon them for this was an unheard of combination of the academic and the frivolous. Ellis looked hard at the brave young lady who, by the way, was Martha Peterson,* now Dean of Women at the University of Wisconsin, and with each student hanging upon every word, said, "What we need now is a knife". A young man in the class, being happy that he could use the

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* Martha Peterson was President of Barnard College at Columbia University from 1967 to 1975; in 1975 she was elected President of Beloit College in Wisconsin. -- G.B.P.

instrument on the cake instead of on himself, as he had thought earlier might well be the case, drew a long knife from beneath his coat and handed it to Ellis Stouffer, saying in a voice which shook with relief, "I just happened to have one". This brave young man, by the way, was Gilbert Ulmer, now Assistant Dean of the College of Liberal Arts and Sciences at the University of Kansas.

Many other anecdotes could be used to illustrate innumerable facets of the life and personality of Ellis Stouffer. In fact, illustrations pile one upon the other and time is the only limitation to the number of examples. I know that as I presented my anecdotes, most of you in the audience, outlined in your own minds many unique relationships which you lived together with Ellis Stouffer.

We here this afternoon have only briefly touched upon his contributions to the University of Kansas and to ourselves. We have but scratched the surface. We have scarcely mentioned his impact on higher education outside of Lawrence for after all, this is a family affair. I know that he visited every institution of higher education in this state and many in surrounding states as well as many in far places. I sense his impact on those other institutions each time I attend meetings of the North Central Association of Colleges and Secondary Schools, in which he was so active, in Chicago, or national meetings of other associations in the field of higher education. At every meeting, without exception, someone asks kindly and with real affection concerning Ellis Stouffer.

Length, breadth and depth--all three, and a rich measure of all. No matter how one measures, or in what area, local, national or personal, the life of Ellis Stouffer has had all three dimensions--and reached toward infinity in each of the three.

3. "The Role of Ellis B. Stouffer in the Development of The University of Kansas", by Raymond Nichols.

(The E. B. Stouffer Conference in Mathematics was held on October 24-25, 1974. At the opening session at 10:30 a.m. on Thursday, October 24, Chancellor Emeritus Raymond Nichols read a paper on Dean Stouffer. The paper was entitled "The Role of Ellis B. Stouffer in the Development of The University of Kansas". At the end of the session, Mr. Nichols handed his manuscript to me. -- G.B.P.)

The rise and fall of civilizations, governments, and organizations are recorded in the pages of history largely in terms of the contributions or failures of the individuals who wore the mantles of leadership. Often the contributions of participants at second levels of administration are either overlooked or inadequately reported. Such oversights are understandable in light of requirements to condense time and events into a form that will be attractive to and readable by the general public. Understandably, but unfortunately from my point of view, the unique contributions of Ellis Stouffer have not received the credit which they deserve. I mentioned these contributions briefly in remarks at the memorial to Mr. Stouffer on November 30, 1965, and I now add a footnote to give appropriate recognition to his services in the crucial third quarter of the university's history.

During his forty-one years of active service at the University, Mr. Stouffer served with distinction in three important and basic capacities--teacher, scholar, administrator. I did not personally know Mr. Stouffer as teacher, but I early became aware that he possessed in high degree and utilized regularly the chief ingredient of the great teacher, the practice of treating the student as an individual with his own peculiar abilities and problems rather than as an anonymous number subject to rigid rules and regulations. Personal confirmation of this quality came on numerous occasions when I observed him working with a student at a blackboard in a classroom or on a pad of paper in his office. John H. Nelson who succeeded Mr. Stouffer as dean of the Graduate School called attention to this practice in his remarks at the memorial service for Mr. Stouffer. His counseling was characterized by warmth, sincerity, and concern for the individual.

Mr. Stouffer's standing as a scholar is widely known--through his published research papers, by his studies in Italy as a Guggenheim fellow, by his presentation of papers at two of the three International Congresses of Mathematicians which he attended, and most significantly by his designation by his peers as a starred man of American science, a distinction gained by few midwestern professors.

It is my judgment that it was as an administrator that Mr. Stouffer made his major contribution to the University of Kansas--as chairman of the department of mathematics, as Dean of the Graduate School, as Dean of the University, and as chairman of the Budget Committee. The promise of those rare qualities which distinguish high quality of leadership from run-of-the-mill ability came to the attention of Chancellor Lindley soon after his assumption of the chancellorship in 1920. It was only two years later that Mr. Stouffer at the tender age of thirty-eight became assistant to the chancellor and dean of the Graduate School. It followed naturally a few years later that he would become chairman of the Budget Committee, a position he was to hold for more than twenty years.

It is about Mr. Stouffer's contributions in this capacity that I want to comment. In limiting my comments to this particular administrative service I am not overlooking Mr. Stouffer's significant contributions to the department of mathematics, the Graduate School, the Association of American Universities or the American Mathematical Society. It is only that in my judgment his service on the Budget Committee enabled the university to survive the depression years without loss of hope and with some semblance of momentum.

The Budget Committee was without doubt the most influential group in the university during those years. An innovation established by Chancellor Lindley, it was based on the philosophy that the Chancellor could be effective as decision maker only if all pertinent data on any particular problem were assembled and presented to him, with recommendations. In order to serve efficiently in this capacity, the committee was constituted to represent major academic units of the University on a rotating basis, but for the sake of continuity with part of the membership permanent, including the chairman and the secretary.

The importance of the committee to operations of the University is clear when we understand that it made recommendations to the Chancellor on all departmental budgets, following conferences with departmental chairmen and their deans or supervisors. The committee made specific recommendations on individual salaries for both faculty and service staff; on departmental allocations for supplies, expenses, and equipment; on promotions in academic rank; on tenure; and on leaves of absence. This kind of operation may seem highly questionable and undemocratic to the current generation who believe in decentralized budgeting and active participation of both faculty and students in university governance. But during the years of financial famine which were imminent in 1930 but unsuspected by most educators, it is my judgment that the University of Kansas as a quality institution--principally at the undergraduate level--survived the financial woes of the depression and its aftermath only because of the skillful use of scarce resources under the wise leadership of Ellis Stouffer. Because of his long and intense support of the faculty his standing with that group was unquestioned. They had absolute confidence in his leadership; they could accept his statement that in years of gross underrun of tax collections there was no alternative to a cutback in legislative appropriations--8 percent in 1931-32, 22 percent in 1932-33, 33 percent in 1933-34.

In terms of impact on operations of the University this meant, for example, individual salary reductions of up to 25 percent, virtual elimination of equipment purchases, and heavy reductions in departmental general expense. But the faculty lost patience when the austere level of legislative support continued year after year, even after economic revival of the state and the return to pre-Depression levels of funding in all other branches of government--city, county, state, public schools--and in business and industry. Chancellor Lindley was powerless to secure any improvement, in spite of his optimistic statement in the first year of budget reductions that the situation was a one-year moratorium.

Faculty morale all but collapsed. The university lacked resources to compete for first rate faculty to fill vacancies, or to hold superior teachers in the face of offers from universities in states which had received more generous legislative treatment. Maintenance of physical plant and scientific equipment was deferred in increasing and alarming volume, and library acquisitions were all but eliminated. Only critical items remained in operating budgets. The severity of the financial drouth is indicated by the fact that median faculty salaries did not again reach their 1930-31 levels until *after World War II*. Even as late as 1936-37 money was so scarce that only $21,550 was available for salary increases for the entire staff--faculty, secretaries, physical plant personnel; the increases--to 237 persons--averaged $91. Parenthetically, the faculty fared better, with an average of $97. And allotments to departments for supplies and expenses were on the same scale. For example, the allotment to the office of Dean of Liberal Arts was $350, to the Department of History, $50. It appeared that the state's traditional support of higher education had become a myth.

During this seemingly interminable period scarce resources some how were stretched and allocated to provide relatively smooth operations and to enable the University somehow to maintain a sense of dignity and hope for a brighter tomorrow. The key to acceptance of this point of view by the faculty was word of mouth encouragement by Ellis Stouffer and his budget committee--assurance that better times were coming.

Fortunately for the University, Mr. Stouffer was endowed with a combination of qualities needed for guiding the University through these troubled years. He alone of the Chancellor's administrative staff had the qualities essential to meeting the challenge--patience, insight, objectivity, fairness, and inherent faith in the future of the University.

An attentive listener, he always allowed a petitioner time to present his case in full to the Budget Committee. He was completely objective, never letting flattery or prejudice influence his judgment. Only after all the facts were at hand did he invite comments or recommendations from other members of the committee. He was absolutely fair and completely objective in evaluating a case, but his uncanny ability was often called upon to distinguish fact from fiction in a request. At times the committee could not agree; at other times a solution seemed impossible. It was on such occasions that Mr. Stouffer's unique ability came into play, to suggest an answer that had not occurred to anyone else. At such times, after a period of quiet concentration, he would say, "What would you think of this?" or "I wonder if this would work?" Usually he would have a near perfect solution. Committee decisions, although often providing less than requests, normally were accepted by department heads as equitable considering limited overall resources. The honesty, fairness and integrity of Chairman Stouffer were unquestioned. He could be firm, but always was fair and courteous. Mr. Stouffer believed that faculty rewards should be limited to superior performance in two of the three traditional categories--classroom teaching, scholarship, and service to university or the state. He believed that the University could achieve excellence only if it adhered rigidly to such standards; it was unrealistic to expect excellence to emerge from mediocrity.

Ellis Stouffer was the most selfless man I have ever known. He never sought preferment, nor did he exploit any assignment to personal gain. To some people he may have seemed lacking in ambition, but he operated under the personal philosophy of being true to himself. He believed that rewards should come unsolicited and without personal promotion, always in recognition of assignments well done. In all his university duties as well as in his private and social life he ever was a gentleman--as well as a gentle man. His language was respectable and clean; he never lowered himself to the use of profanity or four letter words so common in today's literature. He could be emphatic and expressive normally in words equally acceptable in committee meetings or in conversations with university guests.

Whether his role was teacher or administrator, he always had the assistance and encouragement of his gracious and capable wife Anna and the support of their talented daugher Jean whose vision and generosity has made possible the E. B. Stouffer Chair in Mathematics. Ellis and Anna Stouffer were an impressive team, highly admired and respected by the Lawrence community as well as the University family. When not involved in their regular duties--Ellis in solving university budgetary problems or in entertaining official guests, Anna in her volunteer work for the Girl Scouts, the church, or the University Women's Club--they enjoyed the pleasures of happy family life. Truly they left their imprint on Mt. Oread, both singly and as a team.

Ellis Stouffer "knew what a university should be and the directions in which it should move". That the University maintained such a course during the dark years of and following the Great Depression was due largely to his insight, his perseverence, his encouragement to a discouraged faculty, and his ability to make scarce resources provide extraordinary results. I am sure that those persons who worked with him during those years would agree with me that he kept alive that priceless ingredient without which the University could not have rebounded to reach today's plateau of quality and excellence. To have known and worked with him was a great personal privilege. For having had his wise guidance for so many years the University will be forever grateful--for to him we are indebted for having preserved the University's spirit so that although crushed and bruised it might under proper conditions once again burst into bright flame.

Appendix VII

Florence Black

1889-1974

1. Life on the Cattle Range in the Early Days of Western Kansas, or Moses Moves to Kansas, by Florence Black

2. Florence Black: a paper read by G. Baley Price at the Memorial Service for Florence Black held at 3:00 p.m. on Saturday, September 21, 1974 at the Plymouth Congregational Church in Lawrence, Kansas

1. "Life on the Cattle Range in the Early Days of Western Kansas, or Moses Moves to Kansas", by Florence Black*

Some 85 or 90 years ago my father, Moses Black, came to southwestern Kansas with a surveying party. The group worked in Meade County and made camp by a little stream called Spring creek not far from where we later lived. Spring creek headed in Meade county and after wandering about for some miles disappeared under the ground also in Meade county. It was fed by springs where water cress grew. This surveying party would separate into two groups and periodically return to an appointed base. Their custom in making camp was to dig trenches and run the wagons over them for protection. Indians often visited their camps and were given food. On one of these trips after an absence of some ten days, my father's party returned to find that the members of the other group had been scalped by Indians, their horses run off and everything but the rims of the wagon wheels burned. This tragedy broke up the expedition and the surveying party returned to Illinois.

Evidently the rolling, buffalo grass-covered plains, held a strong attraction for my father, for several years later, about 1885, he returned to Meade county and filed on a homestead. After a sod house was built and ready he sent for mother and the three children. My sister Frances and I were born in the soddie in Meade county. Mother and the children came west by train to Dodge City and by stage coach the last 50 or 60 miles. Many settlers brought old chests or other loved pieces of furniture. My mother brought books and old magazines. Little did she know what their value would prove to be, or again maybe she did know. Father in those early days was a surveyor. With his transit he was away

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* These reminiscences appeared in slightly altered form as "Life on the Prairie: Memories of the Cattle Range of Western Kansas", *Kansas Alumni*, vol. 73 (1974-1975), February 1975, pp. 6-7 [Black 7].

from home often for weeks at a time, settling boundaries and establishing property lines. One of my early memories was being allowed to stay up into the night to watch father check the deviation of the compass from true north. Those nights made the north star seem very important. This checking was done periodically and I was never quite sure whether the magnetic north pole jumped about or just what made the repeated checking necessary. I thought perhaps it was merely a case of Father's Scotch caution.

With Father away, Mother, the children, the chickens and a cow lived in and about the one-roomed sod-house. As far as I know the chickens and cow were "about", not in. That is, unless a chicken, or, later, a pig or a calf, were ill. Then they were often brought in and warmed up back of the cook-stove.

Back to the magazines. These were the days of the open range--almost no fences. There were very few roads or trails. If you were going some place you headed your horse in the direction you wanted to go--always carrying a hammer and staples. If you did come to a fence you took it down, crossed, and nailed it up again. Settlers coming in fenced their land spoiling the range, so it is the history of cattle countries that the cattle men tried to drive out the early settlers. Frighten them away if possible; sometimes riding round their homes at night, firing into the air; sometimes, if the family were not at home, setting fire to their buildings. By the time my family went west the Indians in general were on their reservations but periodically a band would ride through the country killing and stealing. One favorite method of frightening the settlers was to dress as Indians and stage an Indian raid. The cow-boys, however, had borrowed and re-borrowed our books and magazines until they felt very friendly to us. They promised Mother that they would warn her and take care of us if there were real danger from the Indians. Many times Mother saw neighbors driving along the old Jones and Plummer freighting trail a quarter of a mile west of our house, wagons piled high with all the possessions they could crowd in, someone with gun over his knees facing front, another guarding the back trail, and the horses headed for Dodge and the railroad. At no time did the Indians really threaten us. Once after I was large enough to ride, an Indian band came through hunting stolen horses. I was on old Chief, a most trustworthy, but lazy, sorrel horse. I saw the Indians coming when Chief and I were perhaps an eighth of a mile from the house. My bare heels kicking him in the ribs had very little effect so I slid off and we raced (with my bare feet) through a sand-burr patch to the house. What a race!! I won by the length of the bridle reins. Had the reins been longer I would have left that horse farther behind.

Life was rigorous and there were some lean years for the early settlers. However I never heard my parents suggest that they regretted having moved to Kansas. I have heard many tales of the "Big Blizzard". Hundreds of cattle drifted with the storm and many of them died. Range cattle milled round and round our house and barns leaving blood-stained prints in the snow. We did not have enough feed to care for them and be sure our own would survive till grass was available again. If a cow got down one dared not help her up unless there was a pitch-fork or other means of protection at hand, for she would almost certainly charge on her rescuers. One night a long-horned cow chased Father to the house and the next morning she was still there with head against the door. She did not survive the storm but with three children begging to share their own milk with the calf, the calf was fed and did survive.

Prairie fires were one of the fears of my childhood. Mostly they were set by lightning. I have seen them burn for days, smoke visible by day and low flames on the horizon at night. If a fire were seen starting on the range all able-bodied men went to fight it, gunny sacks and barrels of water in the wagons. Fire guards were plowed and back fires burned. There was much excitement in the household when a fire was sighted. Until I grew up a bit I thought that I personally was in danger of burning. Later I knew that the danger was mainly that the range would be ruined and the cattle go hungry. In the first days when the family owned only one horse and buggy, and Father was away in that, fires were a very real threat. If a fire were sighted Mother pulled up the picket-pin and took the cow to plowed ground. One spring there were so many fires that if the picket-pin were pulled up the cow took herself to the plowed field. I have been led to believe that the chickens when they smelled smoke, would turn on their backs and put up their feet the more easily to be carried to safety. I will not vouch for this for my experience is that chickens are not overly obliging.

Lightning killing the stock, and tornadoes, real or expected, were other excitements of childhood. Many times Frances and I were carried to the "cyclone" cave in the night. Only Father was supposed to go above till the danger seemed to be over. I never liked that cave--lighted by a kerosene lantern, dangers lurked in its dark corners. In the house, we had lamps, kerosene, or, as we called them, coal-oil lamps. The place seemed full of lamps when chimneys needed to be cleaned. This task, and churning, could be entrusted to very small girls.

When Father filed on his homestead it was near the site of a proposed town of Touzalin which he had surveyed. By the time I can remember, all there was left of Touzalin was the town well which was fenced to keep out stock. I have ridden over the town site many times. The Rock Island railroad was built through the county missing Touzalin by six or seven miles, so a new town of Meade, also surveyed by Father, was built on the railroad. Only the Rock Island saved the family from being suburbanites. I can remember the first time I saw the smoke of a train. Our education was not being neglected. We were first shown pictures of trains and then at the proper time of day Frances and I were taken to a slight rise on the northmost part of our place and sure enough--a wisp of smoke traveled across the horizon from east to west. Then later--my first visit to town and the train itself. I was large enough to run and run I did--for I had been cautioned to be careful when the train came, but not told that the train remained on the tracks. I headed for the ranch as hard as I could run--it took speed to catch and strength to restrain me. I am sure old Chief, the sorrel horse, never would have caught me. The train was a combination freight and passenger train but I gave it only a glance; my first train, yes, but danger is danger and I planned to outrun it.

Our one cow grew into a herd--as a matter of fact each child had his own herd. My brand was a lazy F on the left hip. A lazy F was an F lying on its back. More land was acquired; a timber claim could be taken by planting a certain number of trees--no provision enforced that they be kept alive, and that was fortunate for without water very few trees survived. Water was all important. The wells of the region were drilled wells. The water level on our place was 150 to 200 feet deep. Water was pumped by windmills which ran continuously, wind permitting, and it generally did--thus filling tanks and ponds for the stock. The water from our well was salty, wonderful cold water and good indeed if you were born to it. Our neighbors, and strangers too, complained about it, and some even insulted us to the extent of bringing a jug of their own water if they were coming for a meal. I can remember the astonishment I felt when after we had lived in town for some time I went back to the home place and took a drink. The water really was salty. All water for household uses was carried to the houses by hand. "Please bring in a bucket of fresh water" was an oft heard request.

We rode horses, always bareback, long before we were large enough to climb on without using cunning. If you were away from wagon-tongues and such things about the barns, maybe you were near a barbed-wire fence, then if the horse could be maneuvered close enough you shinnied up the fence and were on. Horses are wise and your procedure had to be varied. Sometimes we would let the horse graze a bit, then throw a leg over his neck, and when the horse threw up his head you would slide back into place. I have had a horse whirl round and round with head still lowered. That was defeat, but one then tried some other plan--for walking home was unthinkable. At an early age you had your pride, and besides, you were probably several miles from home. Frances and I were nearly always out together so the first mounting was no problem, merely step on your sister's hand or hip and scramble on. To get the second girl on the second horse, that was something else again. One time the two of us were out on our horses and we found a range cow and calf which had crawled into our pasture. We started to drive them out and the cow charged my horse boring a hole in my left leg and lifting me off the horse. Luckily she went back to her calf and I had time to climb on my horse, how I have no idea, maybe right up the horses leg. We rode home and put axle grease on my wound. The family was not told for they might restrict our rides. Next day my brother saw the same cow and she charged him. He lifted his leg out of the way and she gored the horse in the flank. There was much concern for the life of the horse and after each conference over the horse, Frances and I would sneak off and put more alxe-grease on my leg. Both horse and I survived. For the uninitiated, axle-grease, a very heavy grease, was bought in large cans and used to pack the axles of wagons and other farm machinery, a much more simple process than packing the wheels of a car. As I remember it you removed the wheel, daubed a generous amount of grease on the axle-shaft with any handy stick and replaced the wheel. That was axle-grease and it was quite satisfactory for medicinal purposes, too, we found.

Discipline on the prairies? and corporal punishment? Yes, indeed, but I remember only one real whipping each for Frances and me. Hers was a case of disobedience; she deliberately refused to wear her sun-bonnet when told to; mine was an accident, and in my mind should have gone scot-free. I stuck a knife in Frances' eye. I felt the whipping unjust and had distances not been so great I would have run away from home. As it was I left the family and settled down on the north side of the soddie, the side with no doors. I endured the isolation for several hours but when the family hitched the team to the lumber-wagon to go chipping, I silently climbed in too, with my back toward the others. I picked up more chips than any two of the others that day. We gathered cow chips to burn in the cook-stove. Chips made a quick fire but didn't last long so quite a supply was always kept on hand. There was no timber on the prairies to burn and coal was expensive while chips were to be had for the gathering.

Trees were so scarce they were named. Every child these days knows the Lone Ranger, but we knew the Lone Tree. It was a storm-battered cotton-wood four or five miles southwest of our place and was the tree to whose limbs cattle rustlers were attached. Every region in those days needed at least one tree.

Education on the prairies? For a period our Scotch Presbyterian father taught our school, and I can assure you that was quite educational. He made examples of his children. On the other hand when my sister Zada was teaching us she helped me on the side. At that time there were four in the school, two Campbell boys and two Black girls. My burning desire was to finish the arithmetic book before Ross did. Zada helped me work ahead at night. Ross saw no virtue in finishing the book, for what would I do then? It might be of interest to know that all four of us, 100 percent of the enrollment of that country school, later graduated from the University of Kansas.

I wonder if any of you have attended a school picnic like the one we had at the end of one of Father's terms of school. This was shortly after a Dyche expedition had been in our region digging for fossils. Our picnic was a day spent digging for Mastodon bones. We climbed into the buck-board and drove to the sand draws. We dug like beavers--it was hot digging in that sand. Finding the first bone spurred us on to dig for the next. Truthfully I am not sure whether it spurred us on, or spurred our father on, but the result was the same, we kept digging. My sister Frances thought it quite a "bust" (her own words) as a picnic but we came home with bones. The best ones were for the museum at the University of Kansas; the less perfect ones we kept. As I look back on it I am not sure that Mother was too fond of Mastodon bones about the house. She may have secretly agreed with Frances about the picnic.

Part of our extra-curricular education came from campers as they freighted from the railroad down into Oklahoma and the Texas panhandle country. Normally they camped out of doors but in case of bad weather any stranger was welcome inside. A new room and privacy could be obtained by hanging a blanket or sheet from a beam in the ceiling. Conversations ranged from tales of personal experiences and adventures of frontier life to the telling of trick problems which we were to solve. One loved visitor was a young Englishman who worked at one of the nearby ranches. He taught us many things, even including an extra special way of coloring Easter eggs. On a trip back to England he brought Mother a sprig of English ivy. That ivy, kept in the house in a pot, was much cherished and lived for years. We thought it great fun when he told us that he first knew father as "the man who carried a tooth-brush".

Our large one-roomed sod-house had many advantages. With thick walls it was cool in summer and warm in winter. The deep windows were grand places for geraniums to thrive. A prickly-pear cactus grew on the roof but, Woe me, if you were caught climbing the house to pick the cactus fruit. None of us, no matter how small, could be easily excluded from family conferences. Neither, on the other hand, was it easy to escape your elders. In the daytime, yes, but not at night. When company came in the evening, which was not often, there was no escape, so Queen, the St. Bernard dog, and I often crawled under the bed. I can imagine Mother's feelings when she saw two pairs of eyes, Queen's and mine, peering out from under the bed at the guests.

Fresh fruit was scarce and in winter we were generally allotted an apple a day from the apple barrel. If Frances and I ate ours early we sat and watched as the remaining members of the household ate theirs after supper. I can imagine that they sometimes wanted to do away with us, but there was no place for us to go, and besides, we liked to watch. Not infrequently someone felt so sorry or so exasperated that he gave us part of his apple. Sand hill plums were natives of the region as was a small wild grape. Neither grew on our place so going plumming was an expedition. In good seasons we brought home tubs of plums. These were canned with almost no sugar and when they were to be served they were made into plum butter or stewed as sauce. They were wonderful eating. I can remember riding miles to the south of our place to where a stunted mulberry tree grew by the ruins of a claim house. The leaves were eaten off the tree as high as stock could reach but from the vantage of the horses' backs we could glean a few berries, that is on the occasional seasons when the tree bore fruit. In the spring we would ride to that tree many times before the berries were ripe, hoping to beat the birds.

Fresh meat was plentiful--cattle and hogs were butchered in cold weather and chickens eaten during the summers. Vegetables were scarce.

We had no telephones, no electricity, no cars, no bath tubs--but at a comparatively young age we assumed responsibilities. We knew quite a lot about managing stock. If we were sent to cut out a cow and calf from the herd and bring them to the barn--and getting a calf can prove to be no small feat--we knew to stay with the task till they were in the barn. We knew flowers and birds of the prairies. Our knowledge of trees, however, was very sketchy. I still feel no close connection between a walnut table and a walnut tree. Christmas trees at school or church were small leafless trees wrapped in cotton batting. Trimmed with strings of cranberries and popcorn they were still pretty exciting.

Education finally proved our downfall. The family decided we must move to town. At first Frances and I were left on the home place with a young couple who moved in. After a week or so we were warned that on a certain afternoon someone of the family would come for us. Just before they were due we climbed on our horses and rode out on the range to the south. Our Last Stand. They were not to find us. We rode and rode and rode but finally returned. The family was still waiting for us, though not in the best of humor. Further resistance seemed useless so we were taken to town, thus ending life on the cattle range for the Blacks.

2. Florence Black*

Professor Florence Black will be long remembered for a life of devoted service to those about her. She received her A.B. degree from The University of Kansas in 1913; from 1913 to 1915 she taught in the Anthony (Kansas) High School, and from 1915 to 1918 she taught in the Wichita (Kansas) High School.

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* A paper read by G. Baley Price at the Memorial Service for Florence Black held at 3:00 p.m. on Saturday, September 21, at the Plymouth Congregational Church in Lawrence, Kansas.

In 1918 she was appointed an Instructor in Mathematics in The University of Kansas. She received M.A. and Ph.D. degrees from KU in 1921 and 1926 respectively; her Ph.D. dissertation was written under the supervision of Dean E. B. Stouffer. In 1926 she was promoted to an Assistant Professor; and in 1940, to Associate Professor. She was Secretary of the College Faculty for nineteen years--in a period when every meeting began with the reading of the complete minutes of the preceding meeting. Professor Black was treasurer of the Women's Faculty Club from 1930 until it was disbanded recently. Also, she was treasurer of the University's chapter of Sigma Xi from 1948 to 1960. Finally, she was a member of the University's Committee on Scholarships for twenty years; in this position she read and evaluated the applications of thousands of students for scholarships. She retired from active teaching in 1960. Truly, Florence Black served the University and its faculty and students.

Professor Black will be remembered also as one who participated in the life and activities of the University. She was the faculty adviser of the Jay Jaynes, the women's pep club, from the founding of this organization until 1952. Her record of attendance at University football and basketball games is truly phenomenal, and Coach Don Fambrough has said, "Every coach deserves to have at least one fan like Florence Black". But she participated also in the unusual events in the University community. Professor Robert Taft's book entitled *Across the Years on Mount Oread* contains a photograph which shows Miss Black digging dandelions on the first Dandelion Day, April 23, 1941. Professor Taft identified her only with the following subtle compliment in the caption of the photograph: "We have visual evidence of the efficiency of the faculty in this photograph, for the lady nearest the camera (lower right hand corner) is as adept in extracting cube roots as she is in extracting dandelion roots."

Professor Black will be remembered also as one who loved the outdoors. She was fond of swimming, tennis, horseback riding, cross country tours, camping, and traveling to distant places on the earth. She escaped from a shipwreck on a trip to Alaska in 1939; she made a trip to Glacier Bay in Alaska in 1962. In 1969 she made a trip to the Mediterranean and to Tanzania, Uganda, and Kenya in East Africa. But perhaps she was best known for her love of horses and of camping. In a recent letter former Chancellor Deane W. Malott, now President Emeritus of Cornell University, wrote as follows: "I remember once offering her camping rights in the center of the Cornell campus, should she and Wealthy desire to come."

Finally, many will remember Professor Black best as an outstanding teacher, for she, like Chaucer's Clerk of Oxenford, would "gladly teach". Many generations of students--especially engineering students--learned their analytic geometry, calculus, and differential equations from her. She was sympathetic and patient with those who were trying to learn, but she was demanding with those who were careless and lazy. Former Chancellor Malott wrote: "She always impressed me because she seemed to be interested in teaching students, rather than peddling a discipline." A student of hers, well known to us, is Mr. Paul S. Endacott, an All-American basketball player and now retired president of Phillips Petroleum Company in Bartlesville. As a token of their affection, Mr. and Mrs. Endacott established the Florence Black Teaching Award in the Department of Mathematics in 1960; the gift provides an award each year for the best teacher among the Department's first-year assistant instructors. This award preserves in the Department the memory of Professor Black as an outstanding teacher.

In recognition of all of her accomplishments and contributions, the Commission on the Status of Women elected her to the Faculty Women Hall of Fame in 1973.

Florence Black enriched the lives of all of us who knew her; we shall long remember and miss her.

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(Florence Black was born November 22, 1889 on a farm near Meade, Kansas; she died in Lawrence, Kansas on Friday, September 13, 1974. Her ashes were buried in Pioneer Cemetery on the campus of The University of Kansas.)

Appendix VIII

# A Mathematician in World War II, 1943-1945

## Operations Research in the Eighth Air Force

by G. Baley Price, Operations Analyst

Operational Research Section

Headquarters, Eighth Air Force

European Theater of Operations

1943-1945

1. "A Mathematician in World War II, 1943-1945: Operations Research in the Eighth Air Force", by G. Baley Price

The attack on Pearl Harbor, which plunged the United States into World War II, occurred on December 7, 1941. The war brought many changes to The University of Kansas, including a number of war training programs which the University sought as a means of employing its faculty and facilities. Lindley Hall, built with an appropriation which Chancellor Malott secured from the legislature, was badly needed (no significant academic buildings had been built since Snow Hall was completed in 1929), but the University was operating an ASTP program (Army Specialized Training Program), and the enlisted men in this program moved into Lindley Hall as soon as it was completed in 1943. By 1943 the University was also operating a special training program for machinists' mates in the Navy, and the enlisted men in this program lived on the top floor of Frank Strong Hall. Also, by the end of the war the University was operating a V-12 program for the Navy; the students in it took a substantial science and engineering program. Members of the faculty--at least those teaching in these programs--were given draft deferments to enable them to continue in their civilian specialties.

I had spent the year 1936-1937 as an instructor in mathematics at Brown University, and I had continued to have close relations with Dean R. G. D. Richardson and the other mathematicians at Brown. *Mathematical Reviews* began publication in January, 1940, and I spent the summer of 1940 at Brown, working with Dean Richardson and Professor Oswald Veblen, as the unofficial circulation manager (without title) of *Mathematical Reviews* [Price 32]. In the late summer of 1943 Brown University requested that The University of Kansas give me leave so that I could go to Brown to help with war work there. Chancellor Malott declined to release me to Brown, however, saying that Kansas needed me for assistance with its own war programs. Chancellor Malott thus unwittingly doomed me to an overseas assignment with the Army Air Forces. Dean Richardson had been Secretary of the American Mathematical Society from 1921 to 1940, and he was frequently consulted for advice and recommendations. Shortly after Chancellor Malott declined to release me to Brown, Dean Richardson received a request for a recommendation for a mathematician to work in operations research for the Air Force. Dean Richardson had been unable to get me for Brown; he now recommended me to the Air Force.

Shortly thereafter, Chancellor Malott received a telephone call from Colonel W. Barton Leach, normally a Professor of Law in the Harvard Law School but now in charge of operations research for the Air Force in the Pentagon. Colonel Leach told Chancellor Malott that I had been recommended for work in operations research, that the Air Force was requesting the University to give me leave of absence, and that the Air Force was requesting me to accept an assignment as an operations analyst with the Air Force in the South Pacific. Chancellor Malott found it impossible to deny the request of Colonel Leach in the Pentagon, and he therefore reported the request to me. I asked the Chancellor what the Air Force wanted me to do. He replied that they wanted me to work in operations research. "What is that?" was the only response that I could make--I had never heard the term "operations research". The English had developed operations research methods and units in their Royal Navy and Royal Air Force before the United States entered the war, and the United States quickly followed their lead after Pearl Harbor.

After careful consideration and mental adjustment to the prospect of life in the hot and humid tropics in the South Pacific, I reported to Chancellor Malott that I would accept the assignment as requested. Chancellor Malott telephoned Colonel Leach. When Colonel Leach heard that I had accepted, he replied, "Oh, we have already filled the position in the South Pacific; we will send Price to England instead". This sudden and unexpected switch was my first experience with the fortunes of war.

My instructions were to report in Washington on Monday, October 18, 1943. As soon as I accepted the assignment in September, I began preparations to depart. I turned by classes over to others; one of my classes consisted of fifty enlisted men in uniform in the ASTP program. I began the standard series of immunizations at Watkins Hospital (this initial series was continued in Washington and New York and completed in Bermuda), and I bought clothes and other supplies that would be needed for the work in England. Finally, I left Lawrence on Thursday, October 14, 1943 (the University stopped my salary the same day!), made a stop in Mississippi to see my family, and reported to the Pentagon on Monday, October 18.

In Washington I made all my preparations for going to England. I was sworn in at Gravelly Point, the Air Force Annex near the National Airport. I was a civilian throughout the war, but in many respects I was in the Air Force. I carried the standard identification of an officer in the Army (the Air Force was a part of the Army in those days)--an identification card issued by the Adjutant General's Office. My card was number AGO 1284887. (Eventually, for social purposes, I was given the "Assimilated Rank" of Colonel.) In Washington I got a set of "dog tags", and I continued my immunizations--there had not been time to complete the series in Lawrence. I also made the necessary arrangements about my pay, with some being sent to my family in Lawrence and some to me. On Friday, October 22, I proceeded to New York as directed.

In New York I had instructions to talk to Warren Weaver (he had an office at the Rockefeller Foundation in Rockefeller Center), to Mina Rees (she had an office in the Empire State Building and was an assistant to Warren Weaver for some of his important war assignments), and to the Applied Mathematics and Statistics Groups at Columbia University. I saw A. Wald and also Wald's *Sequential Analysis* in a preliminary edition that was classified CONFIDENTIAL. Others there were Saunders MacLane, W. Allen Wallis, Milton Friedman, and Jerzy Neyman. My instructions called for an early departure from New York for England, but transportation was not available--Cordell Hull had used up all of the transportation in connection with the Moscow Conference. Because my stay in New York was prolonged, I continued my immunizations there; the sergeant in the medical unit which I located near the McAlpin Hotel (34th Street and Sixth Avenue), where I was staying, had a needle like a fish hook!

Finally, I was told that transportation would be available for my departure on Sunday, November 7, 1943. I was instructed to check in at the old Air Terminal on 42nd Street opposite Grand Central Station. An airport bus took us to LaGuardia Airport. After having our tickets, passports, identification, and other papers checked by an unusually large number of inspectors and guards, we were allowed to walk across the airfield at LaGuardia Airport and to board a Boeing Flying Clipper anchored in the water at the edge of the field. About 11:00 a.m. we took off and headed for Bermuda--the flight was my first on an airplane! The Boeing Flying Clipper was a big (seventy-five passengers), slow (135 to 140 miles per hour), flying boat. Its cabin was unpressurized and it flew at low altitudes. The November weather on the shorter northern route to England forced us to take the longer route by way of Bermuda, the Azores, Lisbon, Ireland, and a port in England.

Our plane arrived in Bermuda about five hours after it left New York. After a stop of about two hours there, we took off and headed for the Azores. About an hour later the Captain informed us that we were returning to Bermuda--the waves had risen and were now too high in the ocean at the Azores where we would have to land. And the waves remained high at Horta in the Azores for the next two weeks! We were given our freedom in the morning but told to check in by three o'clock every afternoon because we might be able to depart. I received my last immunization at the Air Base near St. George at the north end of the island. We went swimming at a beach on the other side of the island, watched antiaircraft target practice near our hotel, took walks to the aquarium, read at the library in Hamilton, washed our own shirts and wore them unironed, and wrote postcards and letters to our families (few arrived, since the entire Atlantic censorship was located in the resort hotels in Bermuda!). Finally, all of the Pan American Boeing Flying Clippers on the Atlantic run were stopped in Bermuda by the high waves in the Azores. The situation became desperate, and on Saturday, November 20, the passengers were lined up in priority order and a plane-load of those with the highest priority was sent to England by way of South America and Africa. I was too far back in the line--I was sent back to the hotel once more. The next day, however, the waves subsided in the Azores; on Sunday, November 21, we departed from Bermuda for Horta in our Boeing Flying Clipper. We left Bermuda in the late afternoon, and, after a flight of sixteen hours, we arrived in the Azores. After a short stop there, we took off again and arrived in Lisbon at midnight, landing on the river in front of the city.

We arrived in Lisbon at midnight on Monday, and we left at midnight on Tuesday for Ireland. We were somewhat nervous about the trip to Foyne, Ireland--the Germans ran an airline into Lisbon, and they had shot down Leslie Howard's plane between Lisbon and England. When we awoke the next morning, we were flying along the west coast of Ireland--very green, with rain and sleet (Bermuda and Lisbon had been warm and spring-like!). We landed on the river at Foyne, had breakfast, and went through customs. Since Pan American would not fly its planes into England, we were turned over to the English. We departed Ireland in a Sunderland Flying Boat, knowing only that we were headed for the United Kingdom. In the early afternoon we landed in the harbor at Poole on the south coast of England. After a thorough check by customs and security guards, we boarded a train for London.

In Washington I had been instructed to take a flashlight (called an electric torch in England) and to report to the billeting officer at 1 Grosvenor Square when I arrived in London. Our train from Poole arrived in London early in the evening of Wednesday, November 24, 1943. The city was cold, and it was dark and forbidding because of the blackout; the *level of illumination* of the streets was *starlight*. Two of us, myself and another, were assigned to operations research in the Eighth Air Force; the billeting officer found a room for us in the home of an English family. The next day we called a telephone number which had been given to us, and we received instructions about how to proceed to Headquarters of the Eighth Air Force at High Wycombe, about twenty-five miles outside London and halfway between London and Oxford. The headquarters was located on the grounds of the Abbey School, a school for girls. We arrived shortly after noon, were given a lecture on security but no lunch, and told to go to work. It was Thanksgiving Day, November 25, 1943.

In the U. S. Navy, operations research work was centralized at Navy Headquarters in Washington. In the Air Force, however, many separate air forces (e.g., the Eighth Air Force, the Twelfth Air Force, the Fifteenth Air Force, the Twentieth Air Force, etc.) had their own operations research units; they were staff sections that reported to the Commanding General of the particular Air Force. The Air Force operations research office in the Pentagon was a personnel office; Colonel Leach, who had made the original study that recommended the establishment of operations research units in the Air Force, was in charge of it. The operations research section at Headquarters, Eighth Air Force had been established in the summer of 1942; it was known as ORS after its English name, Operational Research Section. By the time I arrived in 1943, ORS had at least six subsections, as follows. (1) Bombing Accuracy. This subsection assessed the accuracy of all bombing and made studies and recommendations based on the resulting data. (2) Bombs and Fuses. This subsection studied the damage inflicted on targets that had been bombed and recommended the bombs and fuses for future targets. (3) Battle Damage. This subsection kept careful records of the damage inflicted on Eighth Air Force planes by German fighters and antiaircraft fire. (4) Radio and Radar Countermeasures. This subsection studied radio and radar problems, and especially jamming and other defensive measures against German radar. (5) Flexible Gunnery and Fighter Defense. This subsection studied the tactics of German fighters and designed, for gunners on heavy bombers, defensive measures to counter them. (6) Administration and Records Section. The name of this subsection describes its duties.

The ORS staff consisted of both civilians and Air Force personnel, but without exception all had civilian backgrounds: there was not a single professional military man in the entire outfit. The ORS staff consisted of lawyers (Colonel Leach undoubtedly promoted the use of lawyers), mathematicians, engineers, physicists, economists, architects, photographers, enlisted men in the Air Force, enlisted WAC (Womens' Army Corps) secretaries, at least one English secretary, and others. At its maximum there were eighty to ninety people in the ORS unit. Lieutenant Colonel (later Colonel) John Marshall Harlan was Chief of the ORS. Colonel Harlan was a distinguished lawyer from one of the leading law firms in New York City (originally the firm of Elihu Root and later the firm of Tom Dewey). Later, President Eisenhower appointed him to the Supreme Court; Justice Harlan resigned from the Court on September 23, 1971, and died on December 29, 1971. Other lawyers from Colonel Harlan's firm in

New York were Lieutenant Colonel Philip C. Scott, Lieutenant Colonel Leslie A. Arps, and Mr. Louis Lusky. The mathematicians in ORS included James A. Clarkson (Brown, Pennsylvania, and Tufts), W. L. Ayres (Michigan and Purdue), J. W. T. Youngs (Purdue, Indiana, and Santa Cruz), Frank M. Stewart (Harvard and Brown), Edwin Hewitt (Harvard, Bryn Mawr, Chicago, and Washington), and myself. Bissell Alderman was an architect who worked in the Bombs and Fuses section. Norris Tuttle was a physicist in Radio and Radar Countermeasures. Shettle was a business analyst in Battle Damage. W. J. Youden, a chemist and biologist who had studied statistics with R. A. Fisher at the Rothamstead Experiment Station in England, was a highly effective applied statistician and one of the leaders of the Bombing Accuracy subsection. J. W. Alexander (topologist, Princeton and the Institute of Advanced Study) and H. P. Robertson (mathematician and physicist, California Institute of Technology) had been members of ORS for a short time after it was established in 1942. Soon after I arrived in England, Lieutenant General James H. Doolittle became the Commanding General of the Eighth Air Force; he held that position during the remainder of the war in Europe.

On my arrival at Headquarters, Eighth Air Force in November 1943, I was assigned to work with the Bombing Accuracy subsection. The remainder of this account of ORS will be concerned entirely with the work of the Bombing Accuracy subsection.

Before describing the work of the Bombing Accuracy subsection, it is necessary to describe the situation which confronted the Air Force when it began operations in 1942. Briefly, the situation was this: the combat operations were conducted under conditions almost wholly unanticipated. First, the bombing was done by large formations (eighteen to twenty-one planes) instead of by single planes. Before the war, the slogan of the Air Force had been "Every Bomb an Aimed Bomb", but the severity of German fighter attacks forced the Eighth Air Force, for defensive purposes, to bomb from large formations. Second, the bombing was conducted at high altitudes. The B-17 airplane was designed to bomb from altitudes of ten to twelve thousand feet, but German antiaircraft fire forced this plan to bomb at altitudes varying from twenty-four to twenty-seven thousand feet. The Norden bombsight was calibrated for the lower altitudes. Third, prewar doctrine stated that the analysis of results and the determination of accuracy would be based on reconnaissance photographs, but this method proved to be almost useless for studies of bombing accuracy. Reconnaissance photographs of targets that had been bombed were frequently delayed as much as several weeks by cloudy weather. Furthermore, important targets were usually bombed by many formations and even by RAF planes, and reconnaissance photographs provided little insight into cause and effect--the tactics that produced good results--that could be used for improving the operations. Fourth, prewar plans called for visual bombing with the Norden bombsight, but, as a result of bad weather over Europe, the Eighth Air Force conducted extensive blind bombing operations with radar equipment. RADAR (RAdio Detection And Ranging) was invented in the United States in the 1930's; the English immediately sensed its value for the protection of Britain and pressed its development rapidly. Somewhat late, the Air Force developed radar equipment for blind bombing, and it was employed immediately in combat without adequate development, planning, testing, and training. Finally, operations research--one means for solving some of the problems created by the unanticipated situations--was new. Operations research methods were developed by the English in the Royal Navy and the Royal Air Force, and the U. S. Navy learned the methods from them after we entered the war.

To the best of my knowledge, the Eighth Air Force never wrote a directive specifying the assignment of the Operational Research Section. It seems probable that no one knew enough to write such a directive. Apparently there was a tacit understanding that the ORS would study the operations of the Eighth Air Force and make recommendations about ways to improve its operations and well-being. If the Bombing Accuracy subsection was to be successful, it must have data about the bombing. Reconnaissance photographs did not provide what was needed. Before I arrived in England, however, the problem had been solved: Clarkson, Scott, and Youden had developed methods for the determination of accuracy from strike photographs and had established routine procedures for analyzing and recording the accuracy of all visual bombing. The accuracy was determined from strike photographs. These were a series of ten to twelve photographs, made at intervals of four to six seconds, by cameras mounted vertically downward in the radio compartment of a plane in the bombing formation. The first photograph in a series usually showed bombs, just released, falling directly below the plane. Later photographs showed the bombs exploding on the ground. The photographs showed the target, and the bombs could be located by the puffs of smoke released by their explosion. The Bombing Accuracy subsection received, in addition to strike photographs from every bombing formation, a complete copy of the teletype mission orders and a complete set of mission reports filled out by the crews after their return from the mission. Also, the Bombing Accuracy subsection had bombing tables for all bombs, maps and photographs of the targets, and information about the cameras needed for an analysis of the strike photographs. In addition to the strike photographs and formal orders and mission reports, the Bombing Accuracy subsection of ORS obtained much informal information that was highly valuable. Crews always reported in their mission reports that they carried out orders; but like any group of Americans their age, they showed initiative--they experimented. Since we had no command functions, and since half of us were civilians anyway, crew members would frequently tell us what they did--some variations produced markedly better results. Any useful information gained was passed along to the entire Eighth Air Force by ORS.

The Bombing Accuracy subsection of ORS routinely prepared and distributed reports on all visual bombing. These reports were sent to all headquarters down to group level (a group was the Air Force unit that occupied one air field). This widespread distribution required us to print--by an antiquated hektograph process--from fifty to sixty copies of every report. A report was issued for every mission that could be assessed (clouds often compelled the formations to resort to radar bombing, the results of which could not be assessed by the same methods or with the same accuracy). The number of bombfalls analyzed in a single report varied from five or ten up to forty or fifty. The report on each bombfall contained a plot of the bombfall showing track of the formation over the target; in addition, there was a tabulation of data which identified the bombing formation and the target and gave the following information: the altitude of the bombing formation, the type of bomb dropped, the aiming errors of the pattern center, the width and length of the pattern, and the percentage of bombs within five hundred, one thousand, and two thousand feet of the assigned aiming point. These bombing reports had a very beneficial influence on the operations of the Eighth Air Force; they essentially turned the bombing operations into a huge competition in which the Germans merely supplied the targets. The Bombing Accuracy reports kept the score in this bombing competition. Although we were the first to emphasize that our bombing reports did not constitute a complete evaluation of the performance of any group, nevertheless the commanders and their crews were anxious to get a good rating even on this partial evaluation of their performance. The ORS Bombing Accuracy reports were highly important because they served to emphasize the objective of the Eighth Air Force, which was *to drop bombs on strategic targets in Germany*. There were times when the Eighth Air Force was in danger of pursuing false objectives such as maximizing the number of German fighter planes shot down, or maximizing the total tonnage of bombs dropped *somewhere* in Germany.

The work of the Operational Research Section was a hand operation in comparison with the computerized operations research methods of the present day. I had a simple and inexpensive slide rule, and I often had the use of a tiny Monroe desk calculator--hand operated--that had neither automatic multiplication nor division. In the entire ORS there was one Frieden desk calculator with automatic multiplication and division. At the very end of the war in the spring of 1945 we discovered that Statistical Control had a tabulator (probably an IBM 407) at Headquarters. Those in charge of it assisted Bombing Accuracy in putting its bombing data on punched cards, and then it was possible to carry out in an afternoon an investigation of some aspect of the bombing that formerly had been completely impossible. But operations research was born and it spent its infancy in the era of hand operations; it grew to manhood in the computer era that followed 1950.

Two examples will be given to illustrate the discoveries Bombing Accuracy made about the bombing of the Eighth Air Force and the nature of the influence it exerted on these operations. The first came to be known as "dropping on the leader". The results of formation bombing were not at all good at the beginning of the war; they certainly did not reach the level of perfection suggested by the oft-repeated statement that "with the Norden bombsight the Air Force can drop a bomb in a pickle barrel". Eventually an example of good performance was observed, however, and from conversations with crew members Bombing Accuracy learned the secret of the good performance. The successful group had realized that there was an inherent contradiction between formation bombing and the slogan "every bomb an aimed bomb". In order to make a sighting on the target, the bombadier had to assume control and fly the plane into position to drop its bombs on the target. The contradiction was this: the pilot must fly the plane in order to avoid collisions and to maintain his proper position in the formation; quite independently the bombadier must fly the plane in order to place his bomb on the target. But every formation had a lead plane that was free to make an unhindered sighting on the target. Realizing this, the successful group had decided that only the lead plane would attempt to make a sighting on the target; the other planes would simply maintain their positions in the formation and drop their bombs when they saw bombs fall from the lead plane--they would "drop on the leader". It was soon demonstrated empirically by the data gathered by Bombing Accuracy that "dropping on the leader" produced better results than "every bomb an aimed bomb". The new method was widely recommended, and it soon became standard operating procedure (SOP) throughout the Eighth Air Force. The bombing reports distributed by the Bombing Accuracy subsection of ORS helped to insure that improved methods would be adopted quickly.

The second discovery that Bombing Accuracy made about the bombing concerned the desirability of dropping bombfalls in "small patterns". Bombing Accuracy was able to demonstrate empirically from the bombing data it had collected that, on the average, small patterns placed a greater total tonnage of bombs on the target than large ones. Accordingly, ORS recommended small patterns, and the crews--by flying tighter formations, reducing delays in dropping on the leader, and other means--found ways to make small patterns. But Bombing Accuracy did not win acceptance for this recommendation easily. There was always a photograph that showed a small pattern that just missed the entire target--if the pattern had only been a little larger, one or two bombs would have struck the target.

The debate over the "small pattern" recommendation served to focus attention sharply on the objective in the strategic bombing of land targets: *to maximize the total tonnage of bombs on the target.* One hit on an industrial plant does very little damage; furthermore, one hit on an industrial plant does not increase the probability of a second hit. The objective in naval bombing is totally different; here the objective is *to maximize the probability of a single hit.* Naval targets are fleeting targets: they present themselves for attack to-day but they are gone tomorrow. Furthermore, a single hit may sink a ship or submarine; also, a single hit will usually increase the probability of a second hit. The theory of naval bombing had been elaborately developed by mathematicians in the United States (recall the group at Columbia University!), and they had prepared elaborate tables giving the angle of attack on a ship or submarine and the spacing of bombs dropped in sequence required to maximize the probability of a single hit. In spite of the photographs of small bombfalls that missed, and in spite of the well-publicized theory of naval bombing, the Bombing Accuracy subsection of ORS eventually convinced the Eighth Air Force, with the help of bombing data from actual missions, that small patterns were desirable. The crews dropped on the leader, and by ingenious means and hard training they made small patterns so that their performance would look good in the ORS bombing reports.

The Bombing Accuracy subsection of ORS gave empirical proof, using the bombing data it had collected, of the desirability of small patterns. If appropriate assumptions were made about the distribution of aiming errors of pattern centers and about the distribution of bombs in patterns, a theoretical proof of the desirability of small patterns could undoubtedly have been given. The proof would have been a complicated one, however, and it probably would not have been convincing to Eighth Air Force commanders and crew members. The fact is that the members of ORS rarely if ever indulged in mathematics more complicated than the calculation of an arithmetic mean. Arithmetic means of probability distributions were useful and easy to compute; mean deviations (another arithmetic mean!) were used to measure dispersions. Standard deviations were too difficult to calculate since we were not well supplied even with good desk calculators. But we demonstrated how effective an arithmetic mean can be if it is applied at the right time and place, and with a certain amount of good judgment.

ORS at Headquarters, Eighth Air Force encountered from the very beginning one of the standard problems of operations research units: how to establish confidence in itself, in its methods, and in its results; how to convince combat commanders and crews that the ORS bunch down at Headquarters knew what they were talking about! We did not go on missions; hence, we were suspect. But, not surprisingly, we demonstrated repeatedly with the help of our strike photographs that the reports of those who did go on missions were wrong. We replied to attacks on our accuracy and trustworthiness with patient explanations of our methods to groups of visitors to our office (a Nissen, or Quonset, hut under a chestnut tree!). Some attacks came in the form of an invitation to visit a group, wing, or division headquarters to explain our methods and recommendations. We always accepted such invitations; usually we sent a team consisting of a lawyer in uniform and a civilian mathematician. These invitations were always welcomed because they resulted in making firm friends and ORS supporters out of the doubting commanders and groups. Eventually we received many friendly visits to our office and friendly invitations to present our latest reports to groups or divisions. By demonstrating that we knew what we were talking about, we eventually won the respect and confidence of the Eighth Air Force.

Preparations for the invasion of Normandy provide an illustration of one of the ways in which the Bombing Accuracy subsection of ORS assisted the Eighth Air Force. One Sunday morning early in the spring of 1944 our telephone rang and we were asked to send someone down to operations headquarters (a three story concrete structure built underground). As often happened, Bombing Accuracy responded by sending a team consisting of a lawyer in uniform and a civilian mathematician; Colonel Scott and I were selected to go on this occasion. When we arrived at the operations headquarters, we were told that the Eighth Air Force and the Royal Air Force had been assigned the task of destroying the marshaling yards on the important railroad lines connecting France and Germany. We were given a list of the targets and told that the Commanding General would like recommendations about how to proceed in bombing them. How soon was our recommendation desired? We were told that Monday, the next day, would be entirely satisfactory!--and General O. A. Anderson had been carrying the list of targets in his pocket since Friday!

Everyone realized that our recommendations could not be prepared so quickly, because many consultations and much work would be required to prepare them. Our first step was to go to our Bombs and Fuses subsection to ask them to locate the aiming points in those targets and to designate the bomb or bombs that would be used on each. There were general purpose bombs of several sizes (500, 1000, and 2000 pounds), incendiary bombs of several types, armor piercing bombs, and so on. The Bombs and Fuses subsection was not able to answer immediately. They asked for time to consult specialists on the nature and construction of continental railroad marshaling yards. They wanted to determine the most vulnerable parts of these targets and the nature of their construction so that they could specify aiming points, bombs, and fuses for each. When Bombing Accuracy received this information, it went to see the FLAK officer in the headquarters--the officer who was informed about the German antiaircraft defenses on all targets, and who would specify the altitude at which the targets would be bombed. At this point Bombing Accuracy consulted its own bombing data to obtain estimates of the Eighth Air Force's probable accuracy on the specified aiming points, with the specified bombs, and at the specified altitudes. Bombing Accuracy analyzed and recorded all of the bombing data it could get; it never sampled the data. Sampling was considered dangerous, because there were times when large variations in accuracy were observed. For example, the accuracy was phenomenally good every time the Eighth Air Force bombed Peenemunde, an installation on the Baltic Sea where the Germans were developing and testing V-1 and V-2 rockets. Thus, in planning the campaign against railroad marshaling yards, the Bombing Accuracy subsection of ORS searched its records for similar targets which had been bombed under similar conditions and made the best estimate it could. The report finally submitted to the Commanding General contained information and recommendatons about the size of the forces required to achieve a certain probability of destruction of the targets under the conditions specified. Bombing Accuracy did not participate in planning the actual missions, and its report was only one part of the information available to the Commanding General when he planned them. Because of other considerations such as weather, the availability of forces, or a critical development in some phase of the war, the Commanding General might modify the ORS recommendations or ignore them altogether. The Operational Research Section exercised no command functions.

Professor J. W. T. Youngs and I were assigned to study the accuracy of blind bombing operations conducted with $H_2X$ radar bombing equipment. We observed that the $H_2X$ equipment had been developed late, and that it had probably been thrown into operations without adequate testing and training. On missions, blind bombing was frequently a last resort when visual bombing proved impossible because of clouds. We knew that the accuracy on $H_2X$ missions was poor, but it was not possible to tell what part of the errors resulted from errors and failures in the radar equipment and what part resulted from weather and other combat conditions. We recommended that we conduct a carefully controlled test of the radar equipment that would eliminate the combat factors. The Eighth Air Force agreed. We were given two B-17 airplanes and crews in the 94th Group, located near Bury St. Edmund. Since it was not possible to simulate targets for $H_2X$ bombing, they had to be real; thus, the bombing had to be simulated--a fact which complicated the assessment of the results. We finally chose two targets in Oxford because an RAF radar installation a few miles north of Oxford, finding itself unengaged at the time, volunteered to assess the simulated bombing for us. One target was the principal street corner in Oxford, and the other was the Morris Cowley Motor Works on the southeast edge of the city. There were two B-17 airplanes and crews, two targets, and two altitudes (18,000 feet and 25,000 feet). I flew with the planes several times in an effort to get the test procedures well established. Several hundred simulated bombing runs were made, and the results were carefully analyzed. As we had suspected, there were serious errors in the $H_2X$ equipment itself. On some days a plane would make ten bombing runs and the simulated bomb strikes would average a mile short of the target. The equipment was not properly calibrated and adjusted. The results were written up in a major report and presented to the Eighth Air Force. Later a similar test of the $H_2X$ equipment was carried out by the Air Force in Florida.

The test of the $H_2X$ equipment brought me close to the war. I lived on the base of the 94th Group near Bury St. Edmund during most of the time when the two B-17's were making simulated bombing runs on the targets in Oxford. Airplanes provided the transportation when it was necessary to visit the RAF radar installation north of Oxford. On one occasion I flew with a visiting group to the RAF training field at Kidlington nearby; the plane was a single engine Canadian Norseman, and the pilot was a harum-scarum survivor of the fighting on Guadalcanal in the South Pacific. Flying an unfamiliar plane, he did not put the wing flaps down for the return take-off. There were seven of us on board; the field had thick grass and standing water; and the runway was short. With the end of the runway approaching, the pilot pulled the plane up into the air, but it dropped back on the runway hard and bounced. On a second try moments later, the plane barely cleared the fence and missed the haystack, but it made it! The pilot laughed at us for being scared. This was surely the narrowest escape of my life.

Captain Gunderson had been a member of one of the test crews. After the test was completed, he returned to combat operations. He started out on a mission to Germany one day, but engine trouble forced his plane to abort. His plane was ordered to fly out over the North Sea to drop its bombs before landing. It did so, but it was unable to reach land again: it fell into the North Sea in fifty foot waves! Captain Gunderson was buried in the Air Force cemetery at Cambridge.

Colonel (Freddie) Castle was in command of the Wing that included the 94th Group, and he lived on the base of the 94th Group. He had been a strong supporter of ORS, and it was undoubtedly for this reason that the $H_2X$ test was conducted with crews and planes from his air base. The Battle of the Bulge began on December 16, 1944, but a dense fog kept all planes on the ground in England until December 24. On that day the fog cleared, and the Eighth Air Force sent out 2,000 heavy bombers with appropriate fighter escort. Colonel Castle led the entire mission onto the Continent. His plane was shot down over Belgium, and he was killed. He had been promoted to Brigadier General, but it is not certain that he received the news before his death.

A final example of the work of the Operational Research Section concerns an ORS report on blind bombing operations in the fall and winter of 1944-1945. The Second Division Headquarters of the Eighth Air Force heard that ORS had prepared this report, and it invited ORS to send a team out to present it to them. The invitation was not accidental; Hazard Gillespie, a brilliant young lawyer from the law firm of John W. Davis in New York City, served as liaison between ORS at Eighth Air Force Headquarters and its Second Division Headquarters at Ketteringham Hall. He informed the Second Division when we had significant results and reports and made certain that we had an opportunity to present our reports and recommendations. (A. E. Taylor, a mathematician from U. C. L. A., served in a similar liaison capacity at Third Division Headquarters at Elveden Hall near Thetford.) ORS decided that Colonel Scott and I would go to the Second Division, and Colonel Scott decided that I would present the report. Since the report showed that, on the missions analyzed in it, the bombs had been scattered uniformly in a circle of radius five miles about the assigned aiming point, the results were not very flattering to the Air Force. Colonel Scott--in uniform--had no particular desire to describe the poor performance of the Air Force to the Generals, and in any case I had prepared the report. I had no escape. My audience at Second Division Headquarters was a select one: there were about twenty present, with four Generals on the front row and no one lower than a Major in the room. With much trepidation I told my story, not knowing what would happen when I finished.

When I sat down, one of the Generals on the front row jumped up and said, "This report shows that we have misused the Air Force. We have wasted crews, airplanes, and bombs. What an awful way to run an Air Force!"

But another General jumped up and said, "This report shows that we have used the Air Force exactly right. We have kept the pressure on the enemy at all times--in good weather and in bad."

And while the Generals argued about how to use and operate the Air Force, Colonel Scott and I went out the back door and went home. This episode emphasized once more that the Operational Research Section supplied information, data, and recommendations, but that the Generals made the *decisions* about the operations of the Eighth Air Force.

Since this chapter is a history of operations research and not of the Eighth Air Force, I must omit an account of the Eighth Air Force's campaigns against ball bearing plants and airplane factories, against railroad marshaling yards, against synthetic oil plants and oil storage facilities, and against V-1 and V-2 launching sites. Also, I am forced to omit a description of the occasional tactical bombing of the Eighth Air Force, as when it was diverted from its strategic mission to bomb the Normandy beaches just in front of the landing forces on June 6, 1944, or to bomb the front lines for the break-through at St. Lo a few weeks later. Ernie Pyle's *Brave Men* contains a description of the bombing at St. Lo, and many other books about World War II contain accounts of some aspects of the air warfare. The Operational Research Section at Headquarters, Eighth Air Force contributed its bit toward making aerial bombardment the most destructive weapon ever employed in warfare before the advent of the atomic bomb.

By the spring of 1945 the war in Europe was ending, and plans were being made to shift all forces to the Pacific. Near the end of April I was ordered to attend an Air Force conference in Orlando, Florida, to be held about the middle of May. I found that transportation would be available on the plane of Brigadier General Huglin, Commanding General of one of the Wings in the Third

Division of the Eighth Air Force, who was taking a group to attend the same conference. The trip would be made in a B-17 Flying Fortress airplane that had been specially fitted out for transport purposes; on a trip to Russia earlier in the war the Russians had upholstered the entire radio compartment in solid leather.

I arrived at General Huglin's combat base in East Anglia on the afternoon of Monday, May 7, 1945. I had orders to return to England after the conference, but I took all of my possessions with me--it was clear that the war in England was ending. About five o'clock on the afternoon of May 7, it was announced that the next day--May 8, 1945--would be V-E Day. The B-17 was scheduled to start the trip to the United States early the next morning, and some of us at least tried to get a night's sleep. Peace had come at last, however, and the men in the Air Force felt that it was time to celebrate. The night was filled with a fireworks display of flares and rockets--they would no longer be needed for combat--and with the sounds of the bell and siren of the base's fire truck. The night was a wild one, but the end of the war in Europe had arrived at last!

General Huglin and his party boarded his B-17 Flying Fortress early the next morning and departed for the United States. It was Tuesday, May 8, 1945, and V-E Day. We stopped at the great airfield at Prestwick, Scotland for lunch; in the afternoon we continued on to Iceland. We were escorted into Meek Field, Iceland by two P-47 fighter planes. On V-E Day the escort was largely ceremonial, but the escort had been established originally because the Germans often sent planes out from Norway to raid the airfield. We spent the night at Meek Field, a barren and forbidding area at the southwestern tip of the volcanic island of Iceland. The hotel--named De Gink as were all those on Air Force fields--was only a Quonset hut with large boulders piled around its base to protect it in winter storms, but it provided the first Simmons Beauty Rest mattress that I had slept on since I left the United States.

Early the next morning (Wednesday, May 9) we left Meek Field. The morning was crystal clear, and we had a fine view of the island after we had gained our cruising altitude. The B-17 was an unpressurized plane, and most of our trip was made at an altitude of 10,000 feet. For a short time clouds forced us up to 12,000 feet. We probably would have seen Greenland had the sky not been cloudy at the time we passed it. We ate our first lunch on the plane, but--because of the time change--it was lunch time again when we arrived at Goose Bay in Labrador. We drew our airplane up in front of the Hotel De Gink and all went in for a second lunch. As soon as we had finished lunch, we left Goose Bay for New York. We arrived at LaGuardia Airport just after dark, about 8:00 p.m., on Wednesday, May 9, 1945. The day had required about sixteen hours in the air, but we had come from Iceland, with a stop in Goose Bay, into New York.

I was in civilian dress, and I had just arrived at LaGuardia Airport on an Air Force plane. An FBI agent stepped up and asked for my draft card. I had it in my pocket, but I was so surprised by the request that I did not remember it and I never did show it to him. In England I was accepted as a member of the Air Force and no questions were asked. In the United States it was difficult to carry on the work I was assigned since I was a civilian in civilian dress. Furthermore, I soon realized that the English were a polite people, even after six years of war. In 1945 England was a far pleasanter place to be than the United States.

We spent Wednesday night in New York. I telephoned my wife, in Lawrence, from the hotel. On Thursday we flew to Washington, landing at Bolling Field across the river from the National Airport. In Washington I delivered, to Colonel Leach's Operations Research Office in the Pentagon, a fifty-pound package of IBM punched cards with bombing data from the Eighth Air Force. Also in

Washington I served, unexpectedly, as Lieutenant Colonel Whittaker's best man. He had accompanied us on the plane from England, and his wedding was held in the old church in Alexandria, Virginia.

On Sunday, May 13, 1945, we flew from Washington to Orlando, Florida, in our B-17 Flying Fortress. In the conference, which lasted for a week, we were given the latest information about airplanes and weapons. A major described the fire control system of the B-29 airplane, and he startled us badly when he demonstrated by firing (with blanks only!) the machine guns in the system inside a small hanger. We were given a ride on a B-29 airplane--the principal plane used for bombing in the Pacific, but never used in the European Theater of Operations. For the last part of the conference we flew across a corner of the Gulf of Mexico to Eglin Field near Pensacola, Florida. There we sat in bleachers on the edge of the field and watched live demonstrations of airplanes and their weapons. A B-25 airplane fired a 75 millimeter cannon. Another B-25 fired a Tiny Tim rocket (11 inches in diameter and 12 or 15 feet long) at a target on the water at the edge of the field. A Black Widow (a night fighter) flew by firing its machine guns with tracer bullets at a target. Some planes dropped bombs on the field, and one plane dropped a Napalm bomb (a fire bomb) on the field in front of us. When the show was over, the planes passed in review before our grandstand--at our level and only a few feet away. I found the day one of the more nerve-wracking experiences of the war!

On Sunday, May 20, I returned as far as Washington with General Huglin's plane. From there I tried to reach Lawrence. Transportation was difficult to obtain, but on Monday I caught a ride as far as Chicago with Captain Seaman from the Eighth Air Force, who was flying west in a B-25 airplane. Captain Seaman had intended to let me off in Kansas City, but bad weather prevented him from going there. Accordingly, I took the train from Chicago and arrived in Lawrence on Tuesday, May 22, 1945. I had finally reached home for a few days leave.

Colonel Leach's office in the Pentagon asked me to return to Washington in June; I did so, and I was sent on a trip to the Radiation Laboratory in Cambridge to talk about the accuracy of radar bombing in Europe (my specialty at ORS in England!). Also, Colonel Leach's office asked me to go to the Pacific (to Guam and Okinawa) where the new air forces were being established to continue the war against Japan. I agreed to go on condition that I could have a few days at home to make the necessary preparations. I was told to go to Lawrence and to wait there until I was called. I arrived at home again toward the end of June. I was attached to the Twentieth Air Force, operating in the Pacific, during the remainder of my service with the Air Force.

The period of waiting proved to be a trying time. Every time the telephone rang I suspected that it was the call to go to Washington. But the call was long delayed. Finally, to occupy myself, I wrote a paper entitled "Distributions Derived from the Multinomial Expansion", based on ideas suggested by the work in operations research with the Eighth Air Force. This paper was promptly published in the *American Mathematical Monthly* [Price 3].

Finally, I was asked to report in Washington on Monday, August 6, 1945, to make preparations for proceeding to the Pacific. I did so, but the war was rapidly drawing to a close. Before the day (August 6) was over, the first atomic bomb--the one dropped on Hiroshima--was announced. Nevertheless, I proceeded with preparations to depart. Toward the end of the week I was sent on a recruiting trip to seek mathematicians to work in operations research in the Pacific. I went as far as Providence, Rhode Island, where I persuaded Professor Ray E. Gilman of Brown University to go to the Pacific. He had joined the ORS group at the Eighth Air Force in 1944 and stayed for the remainder of the war in Europe (Ray E. Gilman had been an undergraduate in mathematics at

The University of Kansas; when he graduated, he went to Princeton where he received his Ph.D. degree.) Colonel Livingston Hall, normally a professor in the Harvard Law School, had gone on the recruiting trip with me, but he went on to Cambridge when I stopped in Providence. We joined up again in New York on Monday, August 13. By the next day the war seemed to be coming to an end so fast that recruiting was useless and unnecessary. In the early afternoon, we took the train back to Washington. As we were leaving the Union (railroad) Station in Washington about 6:00 p.m. on August 14, there was an announcement over the radio that the Japanese had surrendered, and that the next day, August 15, would be a holiday. (The formal surrender aboard the U.S.S. *Missouri* was signed on September 2, 1945, Far Eastern Time, and this date is celebrated as V-J Day.) The victory celebration began immediately. Later that evening, President Truman appeared on the north porch of the White House several times to greet those celebrating peace.

Colonel Leach's office asked me to remain in Washington long enough to write a report on the work that had been done in operations research in the Eighth Air Force. The ORS records from the Eighth Air Force had been returned to Washington immediately after the war ended in Europe, and they were filed away in eighty-five filing cabinets at the Air Force Annex at Gravelly Point. I had access to these records, and I used them in an effort to make my report factually correct in every detail. I worked very hard on my report, and even some of the junior officers--now essentially without work to do--helped out with the typing. In about two weeks I completed what I thought was a satisfactory report of about one hundred typed pages, and I asked to be sent home to Lawrence. By September 1, 1945, I had returned to Lawrence and The University of Kansas to stay.

## Appendix IX

## Selected Biographies from *American Men of Science*

Selected Biographies from *American Men of Science*

ASHTON, Professor C(harles) H(amilton), 1200 Ohio Street, Lawrence, Kansas. Mathematics. Cambridge, N. Y., August 12, 66. A.B., Union, 87, A.M., 1890, Sc.D., 22; A.M., Harvard, 93; Ph.D., Munich, 09. Teacher, private school, 87-89; prof. math., Pa. State Normal School, Mansfield, 89-92; instr., Harvard, 94-03; asst. prof., Kansas, 03-10, assoc. prof., 10-15, prof., 15- . Math. Soc.; Math. Asn. Theory of functions of a complex variable.

--Fifth Edition (1933)

BELL, Dr. P(hilip) O(sborne), Bellcomm, Inc., Washington, D. C. Mathematics. Sampsel, Okla., Dec. 9, 08; m. 53; c. 5. A.B., Kansas, 30, fel., 31-32, A.M., 32; fel., Brown, 32-33; fel., Stanford, 33-35, Ph.D. (math.), California, 36. Instr. math., Kansas, 36-39, asst. prof., 39-43, assoc. prof., 43-48, prof., 48-55; res. scientist, Lockheed Missile & Space Div., Calif., 55-58, staff scientist, 58-59; sr. staff physicist, Hughes Aircraft Co., 59-61; sr. staff scientist, Aerospace Corp., 61-64, sr. mem. tech. staff, Bellcomm, Inc., 64- . Lectr., Princeton, 41-42; Nat. Sci. Found. fel., 52-53. Soc. Eng. Sci.; Math. Soc. (asst. ed., Bul., 42-45). Projective differential geometry of curves, surfaces and varieties; complex projective geometry and spaces with affine or projective connection; missile guidance and navigation; orbit analysis, prediction and determination of satellite interplanetary orbits; applications of mathematical physics to dynamics and mechanics.

--Eleventh Edition (1967)

CANDY, Prof. A(lbert) L(uther), University of Nebraska, Lincoln, Nebr. Mathematics. Jonesboro, Ind., March 12, 57. A.B., Kansas, 92, A.M., 93; Ph.D., Nebraska, 98. Prof. math. and civil eng., Campbell Col., 86-91; math., Fremont Nor. Sch., Nebr., 92-93; instr., Nebraska, 93-98, adj. prof., 98-03, asst. prof., 03-04, assoc. prof., 04-07, prof. pure math., 07-35, emer. prof., 35- , head dept. math., 18-19, Chairman, 19-34. Acting dean col. arts and sciences, Nebraska, 22-23, chairman faculty, 24-25. Math. Soc.; Math. Asn.; Nebr. Acad. A theorem on transversals; the solution of an equation of the nth degree; elimination of skidding in motor cars; cyclic operations on determinants; construction of a magic square of order 2n from one of order n by the method of current groups.

--Sixth Edition (1938)

COBLE, Prof. A(rthur) B(yron), University of Illinois, Urbana, Ill. *[2]Mathematics. Williamstown, Pa., Nov. 3, 78. A.B., Gettysburg Col., 97, A.M., 00, LL.D., 33; fellow, Hopkins, 01-02, Ph.D., 02. Asst. math., Hopkins, 00-01; instr., Missouri, 02-03; Carnegie research asst., 03-04; instr. math., Hopkins, 04-06, assoc., 06-09, assoc. prof., 09-18; prof., Illinois, 18-27; Hopkins, 27-28; Illinois, 28- . Ed. cmt., 'Duke Math. Jour.,' 35- ; Nat. Acad.; A.A.; Math. Soc. (councillor, 11-14, assoc. ed., 'Trans.,' 15-19, ed. cmt., 19-25, v. pres., 17, pres., 32-34, chairman, Chicago sect., 22, assoc. ed., 'Jour. Math.,' 18-26, ed. board, 27- );

Math. Asn. (pres. 34). Theory of invariants, groups and correspondences; the quintic and sextic equations; symmetric binary forms and involutions; restricted systems of equations; point sets and Cremona groups; theta and theta modular functions; special point sets; porisms.

--Sixth Edition (1938)

CONWELL, Prof. H(ermon) H(enry), Beloit, Wis. Mathematics. Topeka, Kans., April 18, 86. B.S., Kans. State Col., 07; M.S., Kansas, 15; Ph.D., Wisconsin, 32. Assoc. prof. math., New Mexico, 08-13; instr., Kansas, 13-15; assoc. prof., Idaho, 15-20; prof., Beloit Col., 20- , dean, 35- . A.A.; Math. Soc.; Math. Asn. Linear algebras of infinite order.

--Sixth Edition (1938)

DOWLING, Prof. L(inneaeus) W(ayland), 2 Roby Road, Madison, Wis. *Mathematics. Medina, Mich., Dec. 7, 67. Adrian, 89-90; Ph.D., Clark, 95. Instr. math., Wisconsin, 95-97, asst. prof., 98- . Math. Soc.; Circolo Mat. di Palermo. Geometry; forms of plane quintic curves; higher plane curves; conformal representation of plane triangles upon the upper half-plane; the branches of a plane sextic curve.--Involutions in the plane.

--Second Edition (1910)

DUVAL, Prof. E(dmund) P(endleton) R(andolph), 421 Park Drive, Norman, Oklahoma. Mathematics. Va., Dec. 4, 71. B.S., Texas, 01., A.M., 02; A.M., Harvard, 04; Princeton, 11-12. Instr. math., Wisconsin, 06-08; assoc. prof., Oklahoma, 08-11; Princeton, 11-12; assoc. prof., Kansas, 12-14; Oklahoma, 14-20, 29- . Math. Asn. Algebra.

--Sixth Edition (1938)

EMCH, Prof. Arnold, University of Illinois, Urbana, Ill. *[1]Mathematics. Gossliwil, Switzerland, March 24, 71. Cantonal Col., Solothurn, 86-90, Polytech, Zurich, 90-93; Ph.D., Kansas, 95. Asst. prof. graphics, Kansas, 95-97; prof. math., Technicum, Biel, Switzerland, 97-99; graphic math., Kans. Col., 99-00; asst. prof. pure and applied math., Colorado, 00-03, prof. graphics and math., 03-05; math., Cantonal Col., Solothurn, 05-10; Obere Realschule, Basel, 10-11; asst. prof., Illinois, 11-19, assoc. prof., 19-27, prof., 27- . Math. Soc.; Math. Asn.; Schweiz. Math. Gesell. Problems of closure; transformations realized by linkages; applications of elliptic functions; projective geometry; algebraic geometry; finite groups and their geometric representations; mathematical models.

--Sixth Edition (1938)

FRIZELL, Prof. A(rthur) B(owes), 336 Harvard Street, Cambridge, Mass. Mathematics. Boston, Massachusetts, July 14, 1865. A.B., Harvard, 93, A.M., 00; Göttingen, 06-08; Ph.D., Kansas, 10. Asst. math., Mass. Inst. Tech., 88-91; instructor, New York University, 95-96; Harvard, 97-06; prof., Midland, 08-09; instr., Kansas, 09-12; prof., McPherson, 12-17; instr., Worcester, 19-20, Mass. Naut. Sch., 20- ; Instructor, math., Harvard, summer, 08. Int. Cong. Math., Rome, 08. Math. Soc.; Math. Verein; Circolo Mat. di Palermo. The theory of sets; abstract groups applied to arithmetic; transfinite ordinals.

--Third Edition (1921)

GABA, Prof. M(eyer) G(rupp), University of Nebraska, Lincoln, Nebr. Mathematics. Syracuse, N. Y., June 25, 84. B.S., Chicago, 07, M.S., 08, fellow, 13-14, Ph.D., 14. Instr. math., Kansas, 08-10; Dartmouth Col., 10-12; Mo. Sch. of Mines, 12-13; Cornell, 15-18; assoc. prof., Nebraska, 18-26, prof., 26- . Math. Soc.; Math. Asn.; Deuts. Math. Verein; Circolo Mat. di Palermo. Foundations of mathematics.

--Sixth Edition (1938)

GILMAN, Prof. R(ay) E(dwin), Dept. of Mathematics, Brown University, Providence, R. I. Mathematics. Lansing, Kans., June 19, 87; m. 18; c. 4. A.B., Kansas, 11; fellow, Princeton, 14-16, Ph.D. (math.), 16. Asst. math., Kans. State Col., 11-12; instr., Princeton, 12-14; Cornell, 16-17; asst. prof., Brown, 19-32, assoc. prof., 32-51, Prof., 51- . C.A.C., 17-19, capt., A.F., U.S.A., 44-45. Math. Soc.; Math. Asn. Analysis.

--Ninth Edition (1955)

GOUWENS, Prof. Cornelius, Iowa State College, Ames, Iowa. Mathematics. South Holland, Ill., May 22, 89. B.S., Northwestern, 10; A.M., Illinois, 11; fellow, Chicago, 18, Ph.D., 24. Instr. math., Iowa, 12-16; Kansas, 19-20; asst. prof. Iowa State Col., 20-26, assoc. prof., 26- . A.A.; Math. Soc.; Math. Asn. (sec.'s, Iowa sect., 33- ); Iowa Acad. Invariants; group and number theory; algebra.

--Sixth Edition (1938)

HARTWELL, Prof. Geo(rge) W(ilber), Hamline University, St. Paul, Minn. Mathematics. Hamburg, N. J., Sept. 14, 81. Ph.B., Wesleyan, 03; fellow, Columbia, 05-06, A.M., 06, Ph.D., 09. Instr. math., Mich. Agr. Col., 03-05; asst., Columbia, 06-07, lecturer, 07-08; asst. prof., Kansas, 08-09; prof., Hamline, 09- . Math. Soc.; Circolo Mat. di Palermo.

--Second Edition (1910)

[The Third Edition (1921) states that Hartwell died in 1917.]

HASSLER, Prof. J(asper) O(le), 425 S. Lahoma Ave., Norman, Okla. Mathematics, Astronomy. Harviell, Mo., May 14, 84; m. 07; c. 3. A.B., William Jewell Col., 07; M.S., Chicago, 13, Ph.D. (math.), 15. Teacher, high sch., Ariz., 07-11; Ill., 12-17; instr. math., Kansas, 11-12; Crane Jr. Col., 17-20; assoc. prof., Oklahoma, 20-23, prof. math. and astron., 23- . A.A.; fel. Math. Soc.; Math. Asn.; Nat. Council of Teachers Math. (pres., 34-35); Astron. Soc. Differential geometry; teaching mathematics; variable stars; plane nets periodic of period 3 under the Laplace transformation.

--Ninth Edition (1955)

HESS, Prof. Geo(rge) W(ellman), 8009 Berney Ave., Birmingham, Ala. Mathematics, Astronomy. Waterford, Mich., Sept. 16, 78. A.B., Kalamazoo Col., 06; Illinois, 09-10; A.M., Kansas, 11; Ph.D., Michigan, 16. Prof. math., Shurtleff Col., 13-19; Bethany Col. (W.Va.), 19-20; instr., Carnegie Inst. Tech., 20-22; prof., Whitworth Col., 22-23; Union (Tenn.), 24-26; assoc. prof., Howard Col. (Ala.), 26-30, prof., 30- . A.A.; Math. Asn. Computation of orbits.

--Sixth Edition (1938)

HOLZINGER, Prof. K(arl) J(ohn), 5647 Dorchester Ave., Chicago, Ill. Education, Psychology. Washington, D. C., Aug. 9, 92. A.B., Minnesota, 15, A.M., 17; Ph.D., Chicago, 22. Instr. math., Kansas, 15-16; Minnesota, 16-17; educ., Chicago, 20-23, asst. prof., 23-25, assoc. prof., 25-29, prof., 29- . Statist. Asn. Educational and psychological statistics; factor theories of intelligence; construction of tests; correlation of mental and physical traits; the relative influence of heredity and environment; statistical tables; tracts for computers; twins.

--Sixth Edition (1938)

JORDAN, Prof. H(erbert) E(dwin), 1600 Kentucky St., Lawrence, Kans. Mathematics. Lemonville, Ont., Can., Feb. 18, 78. B.A., McMaster, 00, M.A., 01; Ph.D., Chicago, 04. Instr. math. and science, Brandon, 04-06; math. and physics, Mich. Col. Mines, 06-11; asst. prof. math., Kansas, 11-25, assoc. prof., 25- . Linear groups.

--Sixth Edition (1938)

LEFSCHETZ, Prof. S(olomon), b. Moscow, Russia, Sept. 3, 84; nat.; m. 13; Mathematics. M. E., Ecole Cent., Paris, 05; Ph.D. (math.), Clark, 11; hon. Sc.D., Charles Univ., Prague, 34, Mexico, 51, Inst. Lombardo, 52, Clark, 53, Paris, 59. With Westinghouse Elec. & Mfg. Co., 07-10; instr. math., Nebraska, 11-13; Kansas, 13-16, asst. prof., 16-20, assoc. prof., 20-23, prof., 23-24; vis. prof., Princeton, 24-25, assoc. prof., 25-28, prof., 28-33, Henry Burchard Fine prof., 33-53, emer. prof., 53- , Chmn., dept., 45-53. U. S. Dept. State exchange prof., Nat. Univ. Mexico, 45-46; mem. Res. Inst. Adv. Study, Md., 58. Feltrinelli prize, Nat. Acad. Lincei, Italy, 56. Nat. Acad. Sci.; AAAS; Math.

Soc. (pres., 35-37; Bocher prize, 24); Philos. Soc.; Math. Asn.; Math. Soc. France; cor. mem. French Acad. Sci. (Bordin prize, 19). Algebraic geometry; topology; differential equations. Address: 11 Lake Lane, Princeton, N. J.

--Eleventh Edition (1967)

MARQUIS, Prof. R(obert) H(oughton), Ohio University, Athens, Ohio. Mathematics. Kingston, Mo., Jan. 31, 02. A.B., Missouri, 22; fellow, Chicago, 25-26, Ph.D., 29; Kansas; Michigan; Wisconsin. Asst. math., Wisconsin, 21-22; instr., Pa. State Col., 22-24; Kansas, 24-25; Michigan, 26-28; asst. prof., Ohio (Athens), 28-35, assoc. prof., 35- . A.A., Math. Soc. Theory of numbers.

--Sixth Edition (1938)

MARVIN, Prof. F(rank) O(lin), 1603 Massachusetts St., Lawrence, Kas. Civil Engineering. Alfred Center, N. Y., May 27, 52. A.B., Allegheny, 71, A.M., 74. Principal, High Sch., Lawrence, Kans., 76-78; instructor math. and physics, Kansas, 75, 79-83, prof. civil eng., 83- , dean, Sch. of Eng., 91- . Engineer, Kas. State Board of Health, 95- . F.A.A. (v. pres., 96); Civil Eng.; Eng. Educ. (pres., 01); Kas. Acad. Resistance of materials.

--First Edition (1906)

MASON, Dr. Max, 1505 Circle Drive, Pasadena, Calif. *[2]Mathematics. Madison, Wis., Oct. 26, 77. B.L., Wisconsin, 98, LL.D., 26; LL.D., Yale, 26, Dartmouth Col., 27, Pomona Col., 37; Ph.D., Göttingen, 03; Sc.D., Columbia, 26. Instr. math., Mass. Inst. Tech., 03-04; asst. prof., Sheffield Sci. Sch., Yale, 04-08; assoc. prof., Wisconsin, 08-10, prof. math. physics, 10-25; pres., Chicago, 25-28; director nat. sciences, Rockefeller Foundation, 28-29, pres., 30-36; v. chairman observatory council and mem. exec. council, Calif. Inst. Tech., 36- . Colloquim lecturer, Am. Math. Soc., 06; lecturer, Harvard, 11-12. Div. physical sciences, Nat. Research Council, 18- , submarine cmt., 17-19. Research staff, U. S. N. Exp. Sta., 17-19. Nat. Acad.; A.A. (v. pres., B., 20); Math. Soc. (assoc. ed., 'Trans.,' 11-17); Physical Soc.; Deuts. Math. Verein. Differential equations; calculus of variations; electromagnetic theory; submarine detection devices; acoustical compensators.

--Sixth Edition (1938)

MESSICK, Prof. C(harles) A(rthur), Bethel College, McKenzie, Tenn. Mathematics. Wilson, Kans., Jan. 7, 96. B.S., Kans. State Teachers Col., 18; A.M., Kansas, 25; Ph.D., Chicago, 30. Asst. instr. math., Kansas, 23-25; Iowa, 25-27; asst. prof., Florida, 27-31; prof. and head dept., Lincoln Mem. Univ., 31-33; computer, Topog. Mapping Surv., Fla., 33-35; prof. math. and head dept., Bethel Col., 36- . Math. Asn.; Fla. Eng. Soc. Infinite series and products; symmetric functions of infinitely many elements; method of determining Bernouilli's numbers.

--Sixth Edition (1938)

MILLER, Prof. E(arle) B(renneman), Illinois College, Jacksonville, Ill. Mathematics. Philadelphia, Pa., Nov. 8, 91. A.B., Colorado, 14; A.M., Chicago, 16, fellow, 20-21. Instr. math., Kansas, 16-18; acting asst. prof., Swarthmore Col., 18-19; instr., Wisconsin, 21-27; prof. and head dept., Ill. Col., 27- . Instr., Michigan, 30-31. Math. Asn. (chairman, Ill. sect., 34). Analysis.

--Sixth Edition (1938)

MILLER, Prof. Ephraim, 1244 Tennessee St., Lawrence, Kas. Mathematics, Astronomy. Carrolton, O., April 25, 33. A.B., Allegheny, 55, A.M., 58. Supt. schools, Findlay, O., 59-70; Lawrence, Kas., 70-74; prof. math. and astron., Kansas, 74- . Univ. librarian, 74-86. Hon. Ph.D., Allegheny, 95. F. A. A.; Math. Soc.; Kas. Acad. (pres., 91); Soc. Belge d'Astron. Differentials; determinants; moons of Mars; corona of the sun; the moon's surface; non-Euclidean geometry. --Variation in latitude.

--First Edition (1906)

MITCHELL, Prof. U(lysses) G(rant), 1313 Massachusetts St., Lawrence, Kans. Mathematics. Nashua, Iowa, Nov. 26, 72. A.B., Kansas, 06, A.M., 07; Ph.D., Princeton, 10. Prin. and supt., pub. schs., 98-04; instr. hist., Kansas, 05-06, math., 06-08; teaching fellow, Princeton, 08-10; asst. prof., Kansas, 10-15, assoc. prof., 15-20, prof., 20- . Assoc. ed., 'Math. Monthly,' 14-19. A. A.; Math. Soc.; Math. Asn.; Hist. Sci. Soc.; Kans. Acad. Projective geometry; history and teaching of mathematics.

--Sixth Edition (1938)

NELSON, Prof. Alfred L(ewis), 16765 Sunderland Road, Detroit, Mich. Mathematics. Moray, Kans., Feb. 8, 91. A.B., Midland Col., 11; A.M., Kansas, 13; Ph.D., Chicago, 15. Instr. math., Kansas, 12; Michigan, 15-20, asst. prof., 20-25; prof. and head dept., Col. City of Detroit, 25-33, Wayne, 33- . A. A.; Math. Soc.; Math. Asn.; Circolo Mat. di Palermo. Projective differential geometry.

--Sixth Edition (1938)

NELSON, Prof. Cyril A(rthur), Rutgers University, New Brunswick, N. J. Mathematics. Troy, Kans., Oct. 19, 93. A.B., Midland Col., 14; A.M., Kansas, 16; fellow, Chicago, 18-19, Ph.D., 19. Instr. math., Kansas 19-20; Western Reserve, 20-21; assoc., Hopkins, 21-27; assoc. prof., Rutgers, 27- . A. A.; Math. Soc.; Math. Asn.; Circolo Mat. di Palermo. Projective differential geometry.

--Sixth Edition (1938)

NEWSON, Prof. H(enry) B(yron), 1702 Massachusetts St., Lawrence, Kas. *Mathematics. Mt. Gilead, O., July 10, 60. B.S., Ohio Wesleyan, 83; Hopkins, 83-84; Heidelberg, 86-87; Leipzig, 87-88; A.M., Ph.D., Ohio Wesleyan, 91. Instr. math. and sciences, Central Tenn. Col., 84-86; math. and sciences, Western

Nor. Col., Bushnell, Ills., 88-90; asst. math., Kansas, 90-92, assoc. prof., 92-05, prof., 05- . F. A. A.; Math Soc.; Kas. Acad.; Math. Verein; Circolo Mat. di Palermo. Theory of algebraic forms; groups of collineations. - A new theory (synthetic) of collineations and their continuous groups.

--First Edition (1906)

NEWSON, Dr. Mary W(inston), 1702 Massachusetts St., Lawrence, Kas. Mathematics. Forreston, Ills., Aug. 7, 69. A.B., Wisconsin, 89; fellow, Bryn Mawr, 91-92; fellow by courtesy, Chicago, 92-93; Ass. Col. Alumnae fellow, 95; Ph.D., Göttingen, 96. Instr. math., Fox Lake, Wis., 89-91; High Sch., St. Joseph, Mo., 96-97; prof. math., Kas. State Agr. Col., 97-00. Math. Soc. Hermite's form of Lame's differential equation.

--First Edition (1906)

OWENS, Prof. F(rederick) W(illiam), Pennsylvania State College, State College, Pa. Mathematics. Rockwell City, Iowa, Nov. 18, 80. B.S., M.S., Kansas, 02, fellow, 02-03; Ph.D., Chicago, 07. Instr. Math., Evanston Acad., Northwestern, 05-07; Cornell, 07-15, asst. prof., 15-26; prof. and head dept., Pa. State Col., 26- . A. A.; Math. Soc.; Math. Asn.; Physical Soc.; Asn. Symbolic Logic; Circolo Mat. di Palermo. Foundations of geometry; applied mathematics.

--Sixth Edition (1938)

PITCHER, Prof. A(rthur) D(unn), Adelbert College, Cleveland, Ohio. Mathematics. Havensville, Kansas, June 17, 80. A.B., Kansas, 06, A.M., 07; fellow, Chicago, 08-10, Ph.D., 10. Instructor math., Kansas, 06-08, asst. prof., 10-11; Dartmouth, 11-15; prof., Adelbert, Western Reserve, 15- . A. A.; Math. Soc.; Math. Ass.; Circolo Mat. di Palermo. General analysis.

--Third Edition (1921)

[Pitcher died in 1923.]

POND, Prof. R(obert) S(pencer), Southwestern, Memphis, Tenn. Mathematics. Elmira, N. Y., July 19, 76. A.B., Washburn Col., 99; A.M., Marietta Col., 08; Hopkins, 08-09; fellow, Kansas, 09-10, Ph.D., 10. Instr., Pendleton Acad., 00-02; Marietta Acad., 02-08; from instr. to assoc. prof. math., Georgia, 10-20; asst. manager, South. Mfg. Co., 20-29; prof. math., Morris Harvey Col., 29-31; assoc. prof., Southwestern (Tenn.), 31- . Collineations in space of four dimensions; basis of grading students.

--Sixth Edition (1938)

REAGAN, Prof. Charles A(rthur), 703 Everett Ave., Wichita, Kans. Mathematics. Mauckport, Ind., Dec. 22, 80. B.S., Moores Hill Col., 16; A.M., Kansas, 26. Prof. math., Hanover Col., 19-23; asst. instr., Kansas, 24-26; prof., Friends, 26- . Math. Asn.

--Sixth Edition (1938)

RICE, Prof. M(artin) E(verett), 1223 Vermont St., Lawrence, Kas. Physics, Electrical engineering, Mathematics. Westfield, N. Y., Nov. 19, 70. B.S., Kansas, 91, M.S., 93; Chicago, summers, 94, 96, Yerkes Observatory, summer, 98. Instr., Dept. Physics and Math., Kansas, 92-96, asst. prof. physics and math., 96-98, physics and electrical eng., 98- . M. A. A.; Astron. and Astrophys. Soc. The inverse of conics and conicoids from the center; effect of magnetism on spectral lines; alternating currents in Wheatstone's bridge.

--First Edition (1906)

RICHARDSON, Dean R(oland) G(eorge) D(wight), Brown University, Providence, R. I. *3 Mathematics. Halifax, N. S., Can., May 14, 78. A.B., Yale, 03, A.M., 04, Ph.D., 06; Göttingen, 08-09; D.C.L., Acadia, 31. Instr. math., Yale, 04-07; asst. prof., Brown, 07-12, assoc. prof., 12-15, prof., 15- , dean grad. sch., 26- . Summers, lecturer, Chicago, 18; California, 20. Trustee, Teachers Ins. and Annuity Asn., 26-30, 31-35. Del., Int. Cong. Math., Zurich, 32. A. A.; Math. Soc. (v. pres., 20, sec'y., 21- ); Math. Asn. (v. pres., 19); Am. Acad.; Asn. Teachers Math. New Eng.; Deuts. Math. Verein; Circolo Mat. di Palermo. Mathematical analysis.

--Sixth Edition (1938)

SCHATTEN, Prof. Robert, b. Lwow, Poland, Jan. 28, 11; nat. Mathematics. Mag., Lwow, Poland, 33; M.A., Columbia, 39, Ph.D. (math.), 42. Asst. prof., Vermont, 43-44; Nat. Res. Coun. fel., Inst. Adv. Study, 44-46; Yale, 45; assoc. prof. math, Kansas, 46-52, prof. 52-61; State Univ. N. Y. Stony Brook, 61-62; Hunter Col., 62- . Mem., Inst. Adv. Study, 50, 52-53; vis. prof., Southern California, 60-61. U. S. A., 42-43. Math. Soc.; Math. Asn. Functional analysis. Address: Department of Mathematics, Hunter College, New York, N. Y. 10021.

--Eleventh Edition (1967)

SCOTT, Prof. William R(aymond), b. Bloomingburg, Ohio, June 25, 19; m. 45; c. 3. Mathematics. B.A., Ohio State, 40, M.A., 41, Nat. Res. Coun. fel., 46-47, Ph.D., 47. Res. assoc. math., Ohio State, 47-48; instr., Michigan, 48-49; asst. prof., Kansas, 49-54, assoc. prof., 54-59, prof., 59-65, acting chmn. dept., 59-61; prof., Utah, 65- . Nat. Sci. Found. fel., 55-56; summer vis. prof., New Mexico State, 57. U. S. A., 42-45. Math. Soc.; Math Asn. Theory of groups. Address: Dept. of Mathematics, University of Utah, Salt Lake City, Utah 84112.

--Eleventh Edition (1967)

SHIRK, Prof. J(ames) A(bram) G(arfield), Kansas State Teachers College, Pittsburg, Kans. Mathematics. McPherson, Kans., Jan. 12, 81. A.B., McPherson Col., 01, A.M., 02; M.S., Kansas, 05; Chicago, 06, 10; Michigan, 29; Stanford, 30-31. Prof. math. and physics, McPherson Col., 01-04; asst. instr. math., Kansas, 04-06; sciences, Kansas State Teachers Col., Pittsburg, 12-14, prof. math., 14- , head dept., 14-46. A. A.; Math. Soc.; Math. Asn.; Kans. Acad. (pres., 15). Mathematical statistics.

--Eighth Edition (1949)

SMITH, Prof. Guy W(atson), Dept. of Math., University of Kansas, Lawrence, Kans. Mathematics. Castle Rock, Colo., Oct. 7, 85; m. 21; c. 1. B.S., Colorado, 08, M.S., 09; Ph.D. (math.), Illinois, 17. Instr. eng. math., Colorado, 09-13; asst. math., Illinois, 13-16; instr. math. and physics, Beloit Col, 17-18; Kentucky, 18-20; asst. prof. math., Kansas, 20-27, assoc. prof., 27-33, prof., 33- , head dept., 46-51. Math. Soc.; Math. Asn. Linear associative algebra.

--Ninth Edition (1955)

SMITH, Prof. Paul A(lthaus), b. Lancaster, N. H., May 18, 00; m. 35; c. 2. Mathematics. B.S., Dartmouth Col., 21; M.S., Kansas, 23; Chicago, 23-24, Ph.D. (math.), Princeton, 25. Nat. Res. Counc. fel., Harvard, 26-27; instr. math., Barnard Col., Columbia, 27-29, asst. prof., 29-40, assoc. prof., univ., 40-45, prof., 45- . Chmn. div. math., Nat. Res. Coun., 56-58. Civilian with Appl. Math. Group, 44. U. S. A., 18. Nat. Acad. Sci.; Math. Soc. (treas., 37-39). Topology; topological groups; foundations of theory of Lie groups with real parameters. Address: Dept. of Mathematics, Columbia University, New York, N. Y. 10027.

--Eleventh Edition (1967)

SMITH, Prof. R(onald) G(ibson), b. Lamoni, Iowa, Oct. 10, 02; m. 24, 53. Mathematics. A.B., Kansas, 24, M.A., 26, Ph.D. (geom.), 30; Chicago, 25; Calif. Inst. Tech, 27-28. Asst., Kansas, 24-26, instr. 26-27, 28-30; asst., Calif. Inst. Tech., 27-28; assoc. prof., Math., Kans. State Col. Pittsburg, 30-31, prof., 31- , head dept., 46- . Math. Soc.; Math. Asn. Canonical form for the projective differential geometry of curves in n-dimensional space. Address: Dept. of Mathematics, Kansas State College, Pittsburg, Kans. 66762.

--Eleventh Edition (1967)

SNOW, Dr. Francis H(untington), 1345 Louisiana Street, Lawrence, Kas. *Entomology Fitchburg, Mass., June 29, 40. A.B., Williams, 62, A.M., 65; Andover Theol. Sem., 66. Principal, High Sch., Fitchburg, 62; prof. math. and nat. science, Kansas, 66-69, nat. hist., 69-86, bot. and entom., 86-90, pres. and chancellor, 89-01, director, Mus. Nat. Hist., 88-02, Exp. Sta., 91-02, prof. nat. hist., 01-02, org. evolution, syst. entom. and meteorol., 02- . Editor, 'Psyche.' Hon. Ph.D., Williams, 81; LL.D., Princeton, 90. F. A. A.; Nat. Educ. Ass.; assoc. Ornith. Union; Kansas Acad. (pres., five years); Cambridge Entom. Soc. Economic and systematic entomology; meteorology and ornithology of Kansas; artificial introduction into wheat and corn fields of the contagious diseases of the chinch-bug.

--First Edition (1906)

SPRINGER, Prof. George, b. Cleveland, Ohio, Sept. 3, 24; m. 50; c. 3. Mathematics. B.S., Case, 45; M.S., Brown, 46; Ph.D. (math.), Harvard, 49. Moore instr. math., Mass. Inst. Tech., 49-51; asst. prof., Northwestern, 51-54; vis. prof. & Fulbright lectr., Münster, 54-55; assoc. prof., Kansas, 55-57, prof., 57-64; Indiana, 64- ; Vis. prof., Sao Paulo, 61; vis, prof. & Fulbright lectr., Würzburg, 61-62. Ed., J. Math. & Mech., Indiana Univ., 65- . AAAS; Math. Soc.; Math. Asn. Theory of functions of one and several complex variables; harmonic functions; conformal and quasiconformal mapping. Address: Swain Hall-Ent., Indiana University, Bloomington, Ind. 47401.

--Eleventh Edition (1967)

STOUFFER, Prof. E(llis) B(agley), Department of Mathematics, University of Kansas, Lawrence, Kansas. Mathematics. Melbourne, Iowa, Nov. 7, 84; m. 15; c. 1. B.S., M.S., Drake, 07, LL.D., 31; fellow, Illinois, 08-11; Ph.D. (math.), 11. Instr. math., Drake, 07-08; Illinois, 11-14; asst. prof., Kansas, 14-17, assoc. prof., 17-21, prof. 21- , dean grad., 22-46, univ., 46-50, asst. to chancellor, 23-26. Guggenheim fellow, Bologna, Italy, 26-27. A.A.; Math. Soc. (v. pres., 36-38); Math. Asn. (v. pres., 33). Projective differential geometry; invariants of differential equations; determinants.

--Ninth Edition (1955)

ULMER, Prof. Gilbert, b. Alexandria, Ind., Oct. 27, 03; m. 37; c. 6. Mathematics. A.B., Butler, 31; A.M., Kansas, 33, Ph.D. (ed.), 39; summers, Chicago, 33, 34, Columbia, 37. Asst. instr. math., Kansas, 31-34, instr. ed. 34-39, asst. prof. math. & ed., 39-41, asst. dean, Col. Lib. Arts, 41- , prof. math, 56- , assoc. prof., 44-56. Mem. Nat. Coun. Teachers Math.; Math. Soc.; Math. Asn. Projective differential geometry. Address: Dept. of Mathematics, University of Kansas, Lawrence, Kans. 66044.

--Eleventh Edition (1967)

VAN DER VRIES, Dr. John N(icholas), First National Bank Building, Chicago, Illinois. Mathematics. Kalamazoo, Mich., May 23, 76. A.B., Hope Col., 96, A.M., 99, LL.D., 21; fellow, Clark, 98-01, Ph.D., 01. Asst. prof. math., Kansas, 01-07; assoc. prof., 07-12; prof., 12-19; sec'y. cent. dist., U. S. Chamber of Commerce, 18-22, manager north cent. div., 22- . A. A.; Math. Soc. Theory of twisted curves and surfaces; monoids; steinerian and quartic surfaces.

--Fifth Edition (1933)

WALKER, Prof. Helen M(ary), 106 Morningside Drive, New York, N. Y. Statistics. Keosauqua, Iowa, Dec. 1, 91. Ph.B., Iowa Wesleyan Col., 12; A.M., Columbia, 22, fellow, 26-27, Ph.D., 29. Teacher, high sch., 12-21; asst. prof. math., Kansas, 22-24, assoc. prof. teaching math., 24-25; lecturer, Columbia, 25-26, assoc., 27-29, asst. prof. educ., 29-36, assoc. prof., 36- . Mem. nat. board, Y. W. C. A.; A. A.; Statist. Asn.; Math. Asn.; Hist. Sci. Soc.; Educ. Research Asn .; Soc. Study Educ.; Econometric Asn.; Psychometric Asn. History of statistical method; statistical theory and method; teaching of mathematics.

--Sixth Edition (1938)

WERNICKE, Dr. Paul, 738 Rock Creek Church Road, N. W., Washington, D. C. Mathematics. Leipzig, Germany, Jan. 9, 68. Berlin; Ph.D., Göttingen, 03. Prof. modern languages, Kentucky, 94-06; instr. math., Washington (St. Louis), 06-08; Kansas, 08-10; prof. math. physics, Ohio Mechanics' Inst., 10-18; translator and patent examiner, U. S. Patent Office, 18-23; asst. prof. physics, Maryland, 23-24; patent examiner, U. S. Patent Office, 24-36; retired. Math. Soc.; Math. Asn. Analysis situs; mathematical physics; partial differential equations; vector analysis.

--Sixth Edition (1938)

YOUNG, Prof. J(ohn) W(esley), Hanover, New Hampshire. *Mathematics. Columbus, Ohio, Nov. 17, 1879. Ph.B., Ohio State, 99, fellow, 99-00; A.M., Cornell, 1901, fellow, 01-02, Ph.D., 04. Asst. math., Cornell, 02-03; instr., Northwestern, 03-05; preceptor, Princeton, 05-08; asst. prof., Illinois, 08-10; prof. and head dept., Kansas, 10-11; prof., Dartmouth, 11- ; Chief examiner geom., Col. Entrance Exam. Board, 13-15; chairman, Nat. Committee on Math. Requirements, 16-22. Math. Soc. (ed., 'Bul.,' councillor, 07-25); Math. Ass. (v. pres., 18); Math. Verein; Circolo Mat. di Palermo. Automorphic functions; group theory; foundations of geometry; theory of approximations; n-dimensional chains; applications of synthetic methods to analysis; geometry associated with Cremona groups; projective geometry; fundamental concepts of algebra and geometry.

--Fourth Edition (1927)