

A BRIEF HISTORY
OF THE
COLLEGE OF ENGINEERING
UNIVERSITY OF MISSOURI - COLUMBIA

1940 - 1967



by
HUBER O. CROFT

*This Book
is Dedicated to my Wife*

HELEN ANNABLE CROFT

*for her helpful criticisms and suggestions
and her understanding patience*

FOREWORD

There have been at least four comprehensive histories of the University of Missouri - Columbia written by members of the staff. The first was written by President Daniel Read in 1883. The second history was the work of Thomas Jefferson Lowry, first dean of the School of Engineering, and covered the period 1876-1890. "A History of the University of Missouri - 1839 to 1939," was the third work, edited by Professor Jonas Viles with eleven different contributors from various divisions of the University, including a history of the College of Engineering by Professor Mendell P. Weinbach. The last of the four histories, and the most comprehensive, was "History of the University of Missouri," written by Dean Frank F. Stephens and published in 1962.

Both Viles and Stephens were professional historians and wrote in an interesting manner about the background of legislation, the actions of the Board of Curators, the strengths and the frailties of various staff members, the inadequate budgets, and the growth of the student body and physical plant. In contrast with Viles and Stephens, the present writer is a mechanical engineer by training and an engineering teacher of over 40 years' experience, the last of which were happily spent on the staff of the College of Engineering here in Columbia; therefore it is an understatement to indicate that the writer is an amateur historian.

This history of the College of Engineering covers the period from 1940 (the last year covered by Weinbach's history) to 1967 (the year in which Dean Joseph C. Hogan left Columbia to become dean of engineering at Notre Dame). The writer was requested to undertake this interesting task by Dean Hogan and his replacement, Acting Dean Adrian Pauw.

The facts and figures given in the following pages have been gleaned from the histories of Viles, Stephens, and Weinbach; annual reports to the president from the Dean of Engineering; minutes of the meetings of the engineering faculty; minutes of meetings of the Engineering Foundation and engineering alumni; bulletins of the College of Engineering and the Graduate School; and last but not least, from the personal recollections of such staff members as Professors Horace Wood and Harry Rubey. Harry Rubey came to the College of Engineering in 1924, became chairman of the Department of Civil Engineering and was acting dean of the College during several intervals. Much of the history of the Department of Agricultural Engineering is not included here as this department is in the College of Agriculture.

The author is eternally grateful to Talitha Gisler and Mrs. Sam Knowles, for their careful preparation of the roster of engineering faculty, to Mrs. Shirley Pauken for her careful typing of the manuscripts, to Philip Lincoln for numerous helpful suggestions, to Mrs. Jean Stevens for her editing of the manuscript, and to Helen Croft for her corrections and suggestions for the manuscript.

Huber O. Croft

Columbia, Missouri
June 1, 1968

INTRODUCTION

Lord Chesterfield, in a letter to his son in 1750, wrote that "History is only a confused heap of facts," and it may be that the reader of these words may gain the same impression. However, the purpose of this writing is to review the factual events concerning the College of Engineering from the fall of 1940 to the fall of 1967. The previous history of the College from the very beginnings to 1940 has been covered in excellent fashion by Professor Mendell P. Weinbach in his "Engineering at the University of Missouri, 1850-1940," published in 1941 and included in the "History of the University of Missouri, 1839-1939," edited by Professor Jonas Viles as a contribution to the centennial celebration of the University.

The specification for a college, as attributed in 1871 to James A. Garfield, was, "The ideal college is Mark Hopkins on one end of a log and me on the other." This would certainly be a perfect arrangement if a contemporary Mark Hopkins could be found. His knowledge would encompass all of the continually expanding spectrum of knowledge in the humanities, the arts, the social sciences, the applied sciences, and the pure sciences. Since the universal scholar and teacher can no longer be found and no log, nor indeed a forest of logs, can be found large enough to seat the hordes of students knocking at the doors to enter colleges, a revised general specification must be made. The single teacher on the end of a log has expanded to hundreds of master teachers and scholars, each with his own log, offering specialized knowledge, balancing a host of students at the other end of the log—and with each student changing from log to log to fulfill his own specific educational needs.

To parallel this idealized plan for a college or a university, this review of the history of the College of Engineering for the past 27 years will be considered in the following chapters:

- I The Faculty
- II The Curricula
- III The Student
- IV The Research
- V The Buildings

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SIGNIFICANT DATES AND EVENTS

- 1839 Feb. 11 Founding of University as officially recognized by Curators.
- 1840 July 4 Cornerstone laid for University Building.
- 1849 University catalog includes the course, "Civil Engineering With the Use of Instruments."
- 1853 July 1 University Alumni Association organized.
- 1856 Chair of Civil Engineering established. William W. Hudson appointed to chair.
William Barr and Thomas Field were listed in the catalog as "Civil Engineering Graduates of the Class of 1856."
- 1859 Department of Civil Engineering established.
- 1862 Morrill Land-Grant Act passed by Congress.
- 1863 March 17 Land grant accepted by the General Assembly of the State of Missouri.
- 1868 Department of Military Engineering established.
- 1870 Feb. 4 Establishment of College of Agriculture and Mechanic Arts approved by the General Assembly.
- 1871 School of Engineering is incorporated in the College of Agriculture as a special department.
- 1877 The School of Engineering is officially separated from the College of Agriculture. Thomas J. Lowry appointed first Dean of Faculty of the School.
- 1882 A course in electrical engineering is offered by the Department of Physics.
- 1882 Thomas Edison donates an electrical dynamo to the University of Missouri.
- 1884 Jan. 10 First public exhibition of incandescent electric lighting on the University campus.
- 1885 Department of Electrical Engineering established.
- 1888 Rollins Scholarship established.
- 1891 Department of Mechanical Engineering established.
- 1892 Jan. 9 The great fire which destroyed the main University building.
- 1893 College of Engineering moves into its own building.
Dean Thomas J. Lowry retires.
College of Engineering merges with the College of Agriculture.
- 1903 Office of Junior Dean established. Howard B. Shaw appointed to the office.
Department of Chemical Engineering established.
"Discovery" that St. Patrick was an engineer.
- 1904 Frederick P. Spalding appointed Junior Dean.
- 1905 Arthur M. Green appointed Junior Dean.
The first St. Pat's parade and kowtow.

- 1906 College of Engineering is officially separated from the College of Agriculture.
Howard Burton Shaw appointed Dean of Faculty.
Establishment of the Engineering Library.
- 1907 Ada Wilson, BSCE, first woman graduate.
- 1909 Engineering Experiment Station established.
- 1910 Adoption of five-year curriculum in engineering.
- 1913 H. B. Shaw resigns to become commissioner of the newly-created Public Service Commission.
- 1914 Elmer J. McCaustland is appointed Professor of Sanitary Engineering and Dean of the Faculty of Engineering.
The College returns to the four-year curriculum.
- 1917 Department of Agricultural Engineering established.
- 1917-1918 World War I.
- 1925 Missouri Engineers of Chicago establish scholarship.
- 1929-38 The Great Economic Depression.
- 1930 Walter Williams becomes president of the University.
- 1931 March 20 Engineering Alumni Foundation is organized.
- 1935 Frederick Middlebush replaces Walter Williams as president of the University.
E. J. McCaustland retires and F. Ellis Johnson is appointed Dean.
- 1936 New Engineering Laboratories Building completed.
- 1938 Dean F. Ellis Johnson resigns.
- 1938-48 Harry A. Curtis is appointed Professor of Chemical Engineering and Dean of the Faculty of the College.
- 1940 The Frederick C. Norton scholarship established by Dean W. C. Curtis of the College of Arts and Science.
- 1941-45 World War II.
- 1949 Mechanical and electrical portions of engineering laboratories completed.
Dean Harry Curtis resigns and Huber O. Croft becomes new Dean.
- 1950-53 Korean War.
- 1951 Engineering Annex Building completed.
- 1954 President Middlebush retires and Elmer Ellis becomes president of the University.
- 1955 Courses in nuclear fuels and nuclear engineering authorized.
- 1957 Civil and chemical engineering portions of engineering laboratories completed.
- 1958 Electrical Engineering Building and auditorium completed.
Industrial Engineering Department authorized.
- 1961 Dean Huber Croft retired as dean and Joseph Hogan appointed as Dean (1962).
- 1962 Engineering Alumni Foundation Corporation dissolved.
Research Park established.

- Study and use of computer required by all Departments.
- 1964 Viet Nam War begins.
 Board of Curators establishes four-campus University (Columbia, Rolla, St. Louis, and Kansas City) with Elmer Ellis acting-president; president in 1965.
 John Schwada appointed chancellor for Columbia campus.
 Nuclear Engineering Program established.
 Master of science degrees in civil and electrical engineering given in Kansas City by Columbia faculty.
 New Engineering Alumni Organization formed as part of University Alumni.
- 1965 Elmer Ellis retires and John Weaver becomes president of four-campus University.
 Nuclear reactor and laboratories completed (criticality attained in 1966).
- 1967 Joseph Hogan resigns as dean to become dean at Notre Dame, and Adrian Pauw is appointed acting dean.

I. THE FACULTY

A University faculty is a heterogeneous group of dedicated men and women interested in acquiring knowledge, and perhaps wisdom and superior judgment, from contact with each other, by long hours spent in the library, by research and by teaching. The range in scholarly competence varies greatly, from that of the laboratory assistant and assistant instructor to that of the professor or master scholar of national or international renown.

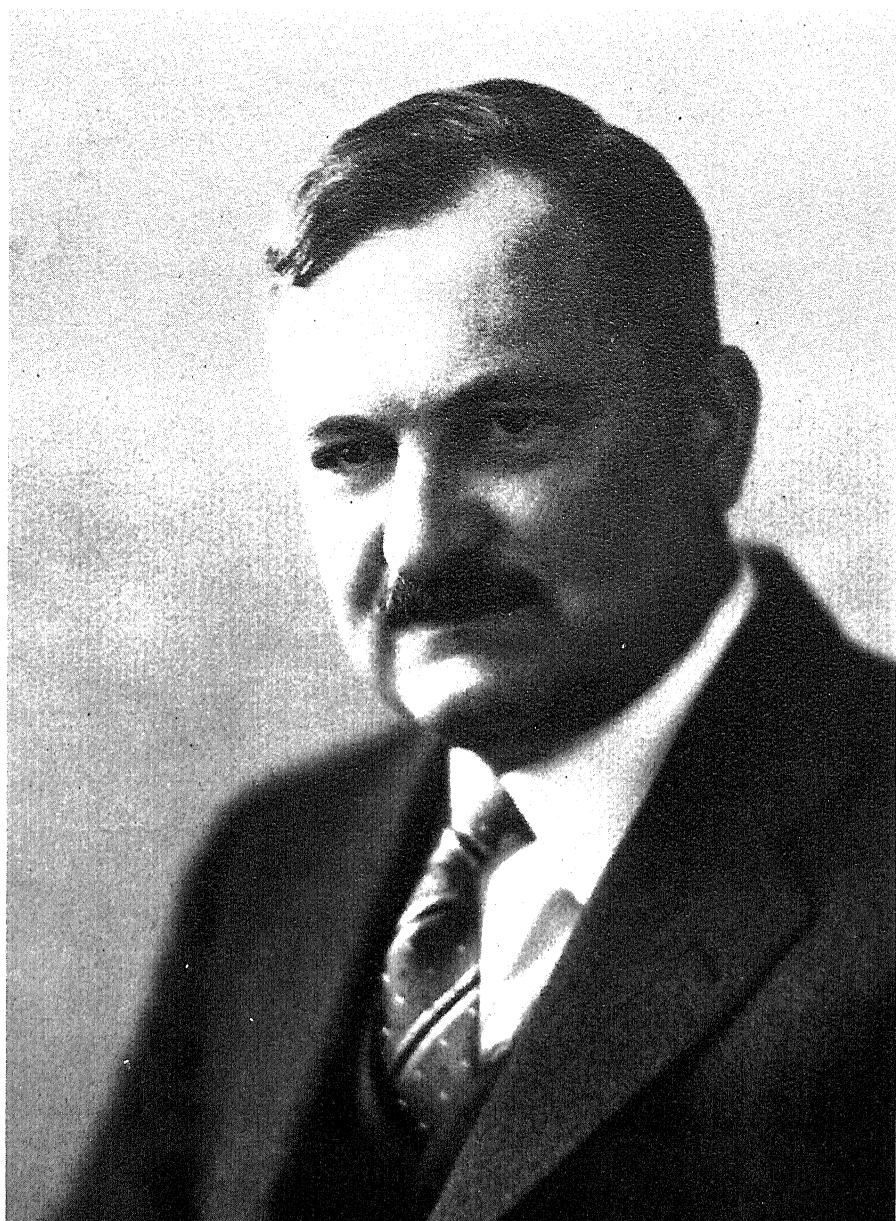
The value of a faculty member depends both on his formal training and his diligence in becoming knowledgeable in current developments of his specialized field of interest. Hence a scholar could become less knowledgeable with time, and therefore less valuable as a teacher or researcher. Most scholars gain excitement and much satisfaction by adding a bit to the storehouse of knowledge by research.

The personnel of the engineering faculty is continually changing since the College is in competition with industry, government, and other engineering colleges. Some of the best men are lured elsewhere by superior salaries. (In fact, a college might well question the excellence of its faculty if none of its faculty members receive enticing offers from other engineering colleges.) Such losses may have a beneficial result, because replacement of the man lost to another institution means employing outsiders, who usually have fresh and stimulating points of view.

This review of the College of Engineering begins in the fall of 1940. This was a difficult and critical year for any college because the Great Depression, which began with the stock market crash of October 1929 and reached its depth in 1934, did not give way to a healthy national economy until about 1938. The budget of the College had been cut to service the low point of enrollment in 1934, and in 1940 it had not been increased to meet the rapidly rising enrollment.

The discoveries in science and the resulting advances in engineering applications made it essential that competent engineering faculty undertake graduate study in mathematics, the basic sciences, and the engineering sciences to obtain master's degrees, and preferably, whenever possible, the doctorate in engineering. The degrees held by the total faculty in the College of Engineering reflected this healthy and necessary trend. For example, in 1940 the faculty consisted of approximately 33 members, 25% of whom had PhD degrees, 33% had MS degrees, and 42% had BS degrees, about half of which had a professional degree of CE, EE, ChE, or ME. By contrast, and illustrating the educational upgrading of the engineering faculty, in the fall of 1966 the faculty consisted of 98 members: 75% had PhD degrees, 23% had MS degrees, and only 2% had BS degrees. It should be noted also that, to present a fresh point of view to the faculty, inbreeding—that is, engaging graduates from the University of Missouri—has been discouraged for a number of years.

In 1940, Dean Harry A. Curtis appointed C. W. Holcomb and A. H. Barr to the mechanical engineering staff; G. K. Gillan to the civil engineering staff; C. H. Gleason to the electrical engineering staff; and Frank Oldham to the chemical engineering staff. These appointments were made necessary by the increasing enrollment.



Harry A. Curtis, Dean 1938-1948.

In 1941, the faculty was saddened by the death of Professor A. C. Lanier, who had contributed so much to the high quality of the College since joining the faculty in 1915. Professor M. P. Weinbach replaced Professor Lanier as chairman of the Department of Electrical Engineering. At this time, the College was once again, facing an extremely critical period as World War II, started in September 1939 by the German invasion of Poland, finally engulfed the United States when the Japanese attacked Pearl Harbor on Sunday, December 7, 1941. Enlistments in the armed services and employment by defense industries made it practically impossible to obtain graduate teaching assistants. In fact, graduate student enrollment dropped from 25 to 2 almost immediately.

Staff members left to enter the armed forces and the war industries. Fortunately, Dean Curtis was able to employ W. W. Towne to replace Professors Logan in sanitary engineering, J. F. Lamb in electrical engineering, and M. B. Tate in civil engineering in 1942.

In April 1942, three men who had contributed so much to the College of Engineering passed away. The engineering faculty held a special memorial service for Dean Elmer McCaustland, Alexander C. Lanier, and Robert W. Selvige.

During 1942, the faculty concentrated on war training programs, with Dean Curtis in charge of the Civilian Pilot Training Program, and Professor Rubey in charge of training diesel engine operators and engineering science and management students. In 1943 the faculty began the Army specialized training program. Meanwhile, the regular student enrollment dropped from about 700 in 1942 to about 100 in 1944, and the number of faculty decreased to eight, all of whom were over 38 years old. Graduate assistants in teaching and research decreased in number from 28 to 2 in the 1941-42 interval.

In the fall of 1944, there were some 12 faculty members in residence, of the 34 men normally engaged in teaching. Eastman Smith was appointed to the mechanical engineering staff, replacing J. Roy Wharton who died during the year. In the meantime, Dean Harry Curtis went on leave as a member of the U.S. Foreign Aid Administration and was replaced by Professor Harry Rubey as Acting Dean.

Finally, the war clouds lifted in Europe. The overwhelming Allied strength in manpower, supplies, and equipment crushed the Nazi German forces and the resulting surrender (V.E. Day) occurred on May 4, 1945. This event was followed shortly by the United States' catastrophic use of the atomic bomb on Japan at Hiroshima (Aug. 6, 1945), and Nagasaki (Aug. 9, 1945). The Japanese surrendered on V.J. Day, Sept. 2, 1945.

However, the critical years of the College were not over, for of some 20 faculty men on wartime leave, only 10 returned to resume teaching. Undergraduate enrollment, about 100 in the fall of 1944, exploded to over 1350 in the winter semester of 1946 and peaked at more than 1500 in the winter semester of 1948. This educational log jam resulted because members of the three 1941 upper classes had enlisted in the armed services, postponing their education until after the war.

To alleviate this critical teaching shortage and return the faculty to normal numbers, during the 1946-47 period Dean Harry Curtis employed Lindon Mur-



Harry Rubey, Acting Dean 1944-45, 1948-49

phy in sanitary engineering in the Civil Engineering Department, and added Joseph Dickensen, R. K. Klinkblock and Carl Sneed to the Department of Mechanical Engineering, along with some 20 graduate assistants. During the same interval, E. C. Philips of the mechanical engineering staff retired, and the "wheelhorse" in the Electrical Engineering Department, Professor Mendell P. Weinbach, died after 39 years of devoted service. A memorial service was also held for A. Lincoln Hyde, who died after 40 years of activity in the Civil Engineering Department.

In the fall of 1947 there were 31 full-time faculty assisted by eight graduate assistants, indicating that the postwar recruiting program had built up the faculty membership to approximately normal strength.

In February 1949, the College experienced a change in administration. Dean Harry Curtis, former chief chemical engineer for the Tennessee Valley Authority (who came to the University in 1938 to replace Dean F. E. Johnson), resigned to accept the appointment by President Franklin D. Roosevelt as Vice-Chairman of the Tennessee Valley Authority. During the tenure of Dean Curtis, who died in 1964, the College experienced a modernization program in personnel, curricula, equipment, and available space—specifically, the building of an addition on the west side of the electrical and mechanical engineering laboratories. Professor Harry Rubey, chairman of the Civil Engineering Department, was then appointed Acting Dean.

In September 1949, President Middlebush appointed Huber O. Croft new Dean of Engineering. Croft, formerly on the faculties of the University of Illinois and Stanford University, and 1946-47 president of the American Society for Engineering Education, was head of the Mechanical Engineering Department at the University of Iowa, Iowa City, when he was appointed Dean of Engineering at the University of Missouri.

In 1949, the faculty passed a resolution of commendation for Dean Curtis. In June of that year, a memorial service was held for Professor A. Lincoln Hyde, who first became a member of the faculty in 1903. The engineering faculty consisted of 41 full-time members with 25 part-time graduate assistants.

In 1950, Roy Quick was appointed as a part-time faculty member in the Engineering Extension Division, and Robert Walker was appointed to teach industrial engineering courses in the Mechanical Engineering Department, as well as assisting in the placement of graduating engineers with industrial concerns.

In 1950, there were 45 full-time members of the faculty assisted by 22 graduate assistants. During 1951, Edwin Wetterstrom and Stan Fistedis were added in civil engineering, John Dixon in electrical engineering, and Orin Grosser in chemical engineering. During the same period, Donald Waidelich of the Electrical Engineering Department was teaching at the University of Cairo, Egypt, on a Fulbright Grant. In 1952, Thomas King joined the civil engineering staff and George Elliot was appointed to the mechanical engineering staff where he taught industrial engineering courses and devoted considerable time to expanding a placement program for seniors. Gordon Moore was also added in mechanical engineering and James Tudor in electrical engineering.



Huber O. Croft, Dean 1949-1962.

During the 1953-54 academic year, Nelson Murray died. He had been an instructor in wood shop and pattern making, and was a cabinetmaker for 46 years. Harry Larue, employed as an instructor in civil engineering in 1913, retired. New additions to the faculty included Adrian Pauw in civil engineering, E.K. Hendrickson in mechanical engineering, and L. E. Marc de Chazal in chemical engineering. The total full-time faculty numbered 33 with 13 graduate assistants.

A change in University administration occurred in 1954 when President Middlebush retired after 19 years in that office. Elmer Ellis, professor of history and dean of the College of Arts and Science, was appointed Acting President, and selected as President in 1955. During this same year Frank Oldham, chairman of the Chemical Engineering Department, died. Howard Irby and Tsi Wu were added to the civil engineering staff. At this time there were 40 full-time faculty with 18 graduate assistants.

During the 1956-57 academic year, Gerhard Beyer was appointed Chairman of the Chemical Engineering Department, Mark Harris was added to the staff in civil engineering, Karl Evans was teaching at an engineering college in India, and F. D. Harris and Tom Bolner were added to the mechanical engineering staff, bringing the total number of full-time faculty to 49 with 25 graduate assistants. Ira Hubbell and Dan Capps were added to the electrical engineering staff, John Love and Raymond McClain were added to the mechanical engineering staff, and Pitts Jarvis was added to the staff of industrial engineering as associate director of the Engineering Experiment Station, during 1957-58. Also during this year, a most important addition to the administrative staff was made when Jack W. Morgan became assistant to the dean, to be in charge of the Placement Office, administer engineering registration, and act as advisor to students. Morgan was appointed Assistant Dean in 1961.

Milo Bolstad was appointed Chairman of the Mechanical Engineering Department in the fall of 1958. During the same period Truman Storvick joined the chemical engineering staff, and Colonel Walker Milner and Edgar Jeffery were added to the civil engineering faculty. Lindon Murphy was sent to Egypt by the World Health Organization to assist in solving the many sanitation engineering problems. Walter H. Miller, who joined the mechanical engineering staff in 1921 to teach engineering drawing and had given valuable assistance to the Dean's Office in advising students and administering registration procedures for the College, retired in August 1959. At this time there were 60 full-time staff members and 20 graduate assistants.

During the 1959-60 academic year, Harry Beach, mechanical engineering, and Professor Harry Rubey, civil engineering, retired. Marc de Chazal spent the year on research at the English Atomic Energy Establishment at Harwell, England. In 1960, D.L. Waidelich took a sabbatical leave to teach and do research at the University of New South Wales at Sidney, Australia. Summer grants of the Atomic Energy Commission were made to D.H.S. Cheng at the University of Michigan, Marc de Chazal at Pennsylvania State College, and C. M. Sneed at Stanford University. Additions to the staff included Harrison Comins in civil engineering, J. M. Beauchamp in industrial engineering, and Alfred Gaskell, mechanical engineering. Ardath Emmons joined chemical engineering as direc-

tor of the Research Reactor, then in preliminary planning stages. The full-time faculty now included 64 members aided by 19 graduate assistants.

In the following year, 1960-61, C.M. Wallis returned from the University of Ankara, Turkey, where he was teaching under a Fulbright Grant, and Adrian Pauw returned from the University of Delft, the Netherlands, where he had a Fulbright Research Grant. At this time, Richard Covert was added to the industrial engineering staff, bringing the faculty total to 67 full-time members with 27 graduate assistants. In the 1961-62 period, Howard Irby of the Civil Engineering Department died.

The College of Engineering entered a new era in August, 1961, when Dean Croft retired from administrative duties to teach thermodynamics and Joseph C. Hogan of the Electrical Engineering Department was appointed Acting Dean. In 1962, Hogan was appointed Dean of the College by President Ellis.

Croft had seen the enrollment in engineering grow from approximately 600 in 1949 to 1583 in 1961, graduate student enrollment increase from 40 to 99 in this same period, the addition of BS and MS degrees in industrial engineering, and an MS degree program in nuclear engineering. He also witnessed construction of an annex to the Engineering Building, three-story additions to the chemical and civil engineering laboratories, and the Electrical Engineering Building and auditorium. He saw the installation of an effective placement system for engineering students, the establishment of the Honor Award for distinguished service in engineering, and an increase in the annual expenditures of the Experiment Station from \$11,800 (1950) to \$133,000 (1961).

Due to rapidly increasing demands for graduate study and the assignment of faculty members to part-time research programs, Dean Hogan made numerous appointments to the faculty including: James Ryan to the chemical engineering staff; K. H. Benson, R. T. Douty and G. H. Stickney to the civil engineering staff; R. L. Carter and G. W. Zobrist to the electrical engineering group; L. G. David to the industrial engineering staff; and G. H. Bunch and W. H. Keown to the mechanical engineering faculty.

During 1963-64, Pitts Jarvis, serving in the Extension Division, resigned; H. C. Poetner was appointed to the civil engineering staff; and W. M. Sangster, professor of civil engineering, was appointed Associate Dean of Engineering and Associate Director of the Engineering Experiment Station. In the fall of 1963, new additions to the faculty included: K. P. Buchert, D. R. Buettner, J. J. Cassidy, C. W. Lenau, A. D. Ray, and R. E. Ward in civil engineering; J. S. Winnick in chemical engineering; S. J. Dwyer in electrical engineering; and J. C. Lysen, J. B. Miles, and C. N. McKinnon in mechanical engineering.

In 1964, the University experienced a revolutionary change. Because of the demands for state-supported higher education in Kansas City and St. Louis, the Board of Curators voted to include additional institutions in these population centers. Thus the University now included four branches: Columbia, Rolla, St. Louis, and Kansas City. This action was supported by increased appropriations by the State Legislature. The new University administration included a president as the chief administrative officer, with individual chancellors for local administration at each of the four branches. During the formation period of 1964. Elmer Ellis (president at Columbia) was appointed Acting President of the over-



Joseph C. Hogan, Dean 1962-67

all University. In 1965, Ellis became President and John Schwada, faculty dean of the School of Business and Public Administration, was appointed Chancellor for the Columbia campus. President Ellis retired in August 1966 and John C. Weaver was his successor. President Weaver, who has a history of successful administrations at several universities, came to Missouri from Ohio State University.

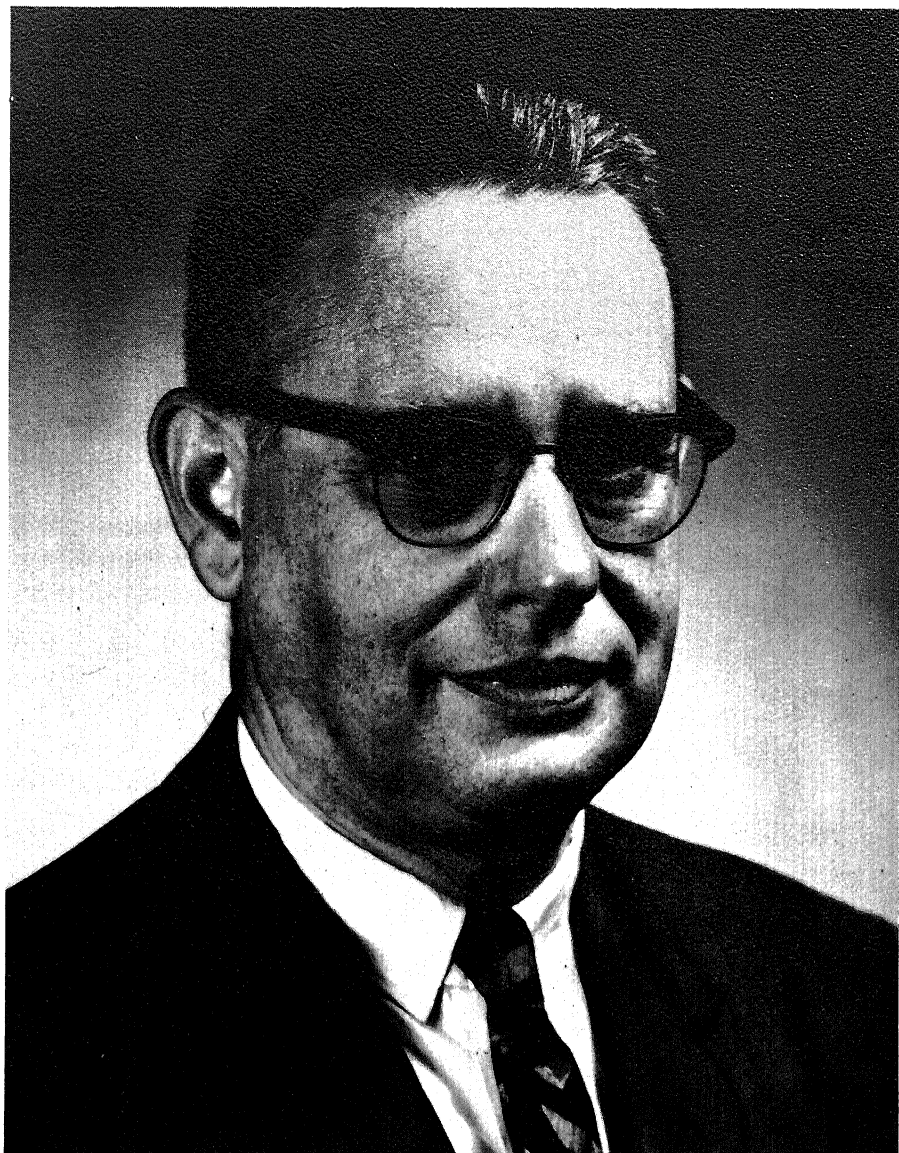
In the fall of 1964, H. W. Wood retired as chairman of the Department of Civil Engineering and Adrian Pauw was selected to replace him. Wood had joined the staff in 1931 and became department chairman in 1956. Pauw joined the staff in 1953. In the 1964-65 academic year, Karl Evans was on leave, teaching at the University of Lima, Peru; J. W. Baldwin received a grant from the Ford Foundation for an engineering residency at the Rust Engineering Co. of Pittsburgh, Pennsylvania, and J. B. Miles received a similar grant for an engineering residency at the General Electric Co. in Schenectady, New York.

During the academic year 1964-65, D. L. King, J. R. Salmons, R. J. Wheeler, H. G. Poertner, and M. Monsees (lecturer) were added in civil engineering; B. D. Weathers, C. I. Carlson, R. G. Combs, and C. C. Mosker were added to the electrical engineering staff; additions to the chemical engineering faculty included R. M. Angus and R. P. Morgan. G. W. Preckshot, from the University of Minnesota, became chairman of the Department of Chemical Engineering, succeeding G. H. Beyer who resigned to join the department at Virginia Polytechnic Institute. Owen Miller was added in industrial engineering, and D. L. Creighton in mechanical engineering.

During the fall of 1965, V. J. Lee was added to the chemical engineering staff. Additions to the civil engineering faculty included: A. Abdul-Baki, D. L. Guell, A. T. Hjelmfelt, J. H. Lane, H. Liu, and H. J. Salane. Also in the fall of 1965, Dean Hogan visited the University of Lima, Peru, where Karl Evans was on leave teaching. The MS graduate courses in civil, electrical, and mechanical engineering were so popular in Kansas City that C. W. Wright and M. Jordan were appointed to the extension staff in civil engineering, and P. W. Braisted was appointed to the extension service to initiate the MS program in mechanical engineering.

In the spring of 1966, T. S. Storvick of the chemical engineering faculty was chosen by the National Science Foundation to receive the coveted Senior Faculty Fellowship to continue his research at the University of Maryland. Additions to the engineering faculty included: C. C. Mosher III in electrical engineering; D. van der Reyden in industrial engineering; P. H. Miller in mechanical engineering; and E. J. Dowdy and G. W. Leddicote in the newly formed nuclear engineering group.

During the fall of 1966, M. Jordan, C. W. Wright, and T. Lam became members of the civil engineering staff; D. D. Sullivan, A. J. Carlson, G. E. Adams, A. A. Mahmoud, T. A. Brubaker, and J. E. Rathke joined the electrical engineering staff; and R. C. Duffield, T. Ishihara, and P. W. Braisted became members of the mechanical engineering faculty. Professor Braisted, who came to the University from Syracuse University, was appointed Chairman of the Department of Mechanical Engineering by Dean Hogan, succeeding M. Bolstad who had been chairman since 1958.



Adrian Pauw, Acting Dean 1967-1968.

Another epoch for the College of Engineering ended in the spring of 1967 when Dean Hogan resigned to accept the deanship of the College of Engineering at Notre Dame, and Associate Dean Sangster resigned to accept the directorship of the School of Civil Engineering at the Georgia Institute of Technology. Dean Hogan had joined the electrical engineering staff in 1947, and Associate Dean Sangster had joined the civil engineering faculty in 1948. Both of these fine administrators worked unceasingly to improve the stature of the College of Engineering, and saw the faculty grow from 67 full-time staff (1961) to 108 (1967); the graduate student enrollment grow from 99 to 264 during this interval; and the research funds increase from \$33,000 in 1961 to \$395,000 in 1966.

In May of 1966, the faculty voted to express their appreciation to President Ellis for his past interest in the College and presented him with a book of photographs taken during his administration. In September, 1967, the faculty voted to express their appreciation to Dean Hogan and Associate Dean Sangster for their leadership of the past six years. Chancellor Schwada appointed Adrian Pauw, chairman of the Civil Engineering Department, to be Acting Dean of the College, and Dean Pauw selected James W. Baldwin to be the new chairman of the Civil Engineering Department.

This concludes a review of the important changes in personnel and number of full-time faculty from the fall of 1940 to the fall of 1967. To the reader, it may appear similar to the contents of an almanac, for none of the pictures of interesting personalities have been drawn nor have disagreements between individuals been recounted. The reader will know that actually each member of the faculty deserves his own biographical sketch, and since this was impossible to accomplish, all information as to personal appearance, good and bad habits, humorous sayings, political opinions, individual contributions to the progress and stature of the College has been omitted with reluctance. Abbreviated information concerning salaries and budgets may be found on page 74.

II. THE CURRICULA

To be superior according to the demands of the profession, engineering curricula must be continually changing in content. As new discoveries are made in science, adaptations of these discoveries must be made in course content. These changes may occur in courses taught by the basic science departments of the university, or in basic engineering courses taught in the early years of the student's program. This may be reflected in a course having the same title and number but with the content changing considerably over the years. Again, a faculty member may have developed a new and useful course for inclusion in the curricula, or perhaps the entrance requirements are increased, permitting curricula changes involving more advanced work in the freshman year.

It may be interesting for the reader to examine the changes in the curricula of the College of Engineering over a 26-year period. The curricula for the fall of 1940 is given on the following pages.

In 1940 the requirements for admission to the college were 15 units or the equivalent of a four-year high school course. The required courses were: three units in English, three in mathematics, one in a laboratory science, and two in history and government. Students with superior high school records who presented the required English and mathematics but were short no more than one unit in the other courses could be admitted by special permission. Students who might be short a half unit of mathematics could be admitted provisionally and take high school mathematics in college, though they would receive no college credit for such work.

1940

CURRICULUM IN AGRICULTURAL ENGINEERING

Freshman Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 2—Trig. and Algebra	5	Math. 4—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem	5	Chem. 15—Organic Chem	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M.E. 1—Engr. Drawing	3	M.E. 2—Descript. Geometry	3
M.S. 1—Military Science	R	A.E. 10—Farm Shop Work	3
P.E. 1—Physical Ed	R	M.S. 2—Military Science	R
First Year Conference	<u>R</u>	P.E. 2—Physical Ed	R
	16	First Year Conference	<u>R</u>
			17

Sophomore Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 5—Calculus	5	Math. 10—Calculus	3
Phys. 3—Gen. Physics	5	Phys. 4—Gen. Physics	5
C.E. 82—Engr. Materials	2	Engl. 75—Public Speaking	3
A.Ec. 1—Agr. Economics	3	A.E. 1—Farm Power and Machinery I	3
F.C. 1—Field Crops	3	M.E. 99—Heat Engineering	3
M.S. 3—Military Science	R	M.S. 4—Military Science	R
P.E. 3—Physical Ed	<u>R</u>	P.E. 4—Physical Ed	<u>R</u>
	18		17

Junior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
E.E. 99—Fund. of Elec. Mach.	3	Soils 1—Soils	5
C.E. 140—Hydraulics	3	A.E. 103—Farm Buildings	3
Geol. 2 Physical Geology	3	A.E. 131—Drainage and Erosion Control ..	3
A.E. 112—Farm Power and Machinery II ..	3	M.E. 116—Analytic Mechanics	4
C.E. 60—Engineering Surveys.	3	Option	<u>3</u>
F.C. 100—Field Crops Management	<u>2</u>		18
	17		

Senior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
C.E. 101—Mech. of Materials	4	Engl. 103—Gen. Literature	3
Hist. 110—Recent U.S. History	3	A.E. 104—Farm Building Design	3
A.E. 150—Special Problems	3	A.E. 122—Irrigation and Drainage	2
M.E. 141—Mechanical Lab	2	Elective	3
Option	6	Option	6
Senior Conference	<u>R</u>	Senior Conference	R
	18	Inspection Trip	<u>R</u>
			17

At the beginning of the second semester of the junior year the student must elect one of the following three options for his major work, and must complete at least 15 hours in that option before graduation.

<i>Mechanical and Electrical Option</i>	<i>Hours</i>	<i>Soil Conservation Option</i>	<i>Hours</i>
M.E. 101	3	C.E. 61	4
M.E. 102	3	C.E. 120	3
M.E. 119	3	C.E. 122	2
M.E. 120	3	C.E. 133	2
M.E. 142	2	C.E. 141	3
M.E. 143	2	Soils 101 or	
E.E. 100	3	A. Ec. 110	3
E.E. 101	3	Soils 102	3
E.E. 110	4		
A.Ec. 110	3		

<i>Structures Option</i>	<i>Hours</i>
C.E. 120	3
C.E. 121	2
C.E. 122	2
C.E. 133	2
C.E. 141	3
C.E. 165	3
C.E. 193	3
A.Ec. 110	3
An. Husb. 100	3

CURRICULUM IN CHEMICAL ENGINEERING

Freshman Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 2—Trig. and Algebra	5	Math. 4—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem.	5	Chem. 2—Gen. Inorganic Chem.	3
Engl. 1—Comp. and Rhetoric.	3	Chem. 26—Qualitative Analysis	2
M.E. 1—Engr. Drawing	3	Engl. 2—Comp. and Rhetoric	3
M.S. 1—Military Science	R	M.E. 2—Descript. Geometry	3
P.E. 1—Physical Ed.	R	M.S. 2—Military Science	R
First Year Conference	<u>R</u>	P.E. 2—Physical Ed.	R
	16	First Year Conference	<u>R</u>
			16

Sophomore Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 5—Calculus	5	Math. 100—Calculus	5
Chem. 110—Organic Chem. (Lec.)	3	Chem. 112—Organic Chem.	3
Chem. 121—Quant. Analysis	3	Chem. 122—Ind. Quant. Analysis	3
Phys. 3—Gen. Physics	5	Phys. 4—Gen. Physics	5
Econ. 10—Industrial Economics	3	Engl. 75—Public Speaking	3
M.S. 3—Military Science	R	M.S. 4—Military Science	R
P.E. 3—Physical Ed.	<u>R</u>	P.E. 4—Physical Ed.	<u>R</u>
	19		19

Junior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Chem. 131—Physical Chem.	5	Chem. 133—Electrochemistry	2
M.E. 116—Analytical Mechanics	4	Ch.E. 104—Engr. Materials	2
Ch.E. 123—Elem. of Chem. Engr.	3	Ch.E. 124—Elem. of Chem. Engr.	3
E.E. 99—Fund. of Elec. Mach.	3	E.E. 100—Fund. of Elec. Mach.	3
Hist. 110—Recent U.S. History	<u>3</u>	C.E. 101—Mech. of Materials	4
	18	Hist. 106—Contemporary Europe	<u>3</u>
			17

Senior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Ch.E. 135—Prin. of Chem. Engr.	3	Ch.E. 136—Prin. of Chem. Engr.	3
Ch.E. 143—Chem. Engr. Lab.	2	Ch.E. 151—Chem. Engr. Project	2
Ch.E. 161—Chem. Thermodyn.	3	Ch.E. 162—Chem Thermodyn.	3
Ch.E. 185—Chem. Plant Design	3	Ch.E. 186—Chem. Plant Design	3
Engl. 102—Gen. Literature	3	Engl. 103—Gen. Literature	3
Elective	3	Elective	2
Senior Conference	R	Senior Conference	<u>R</u>
Inspection Trip	<u>R</u>		16
	17		

CURRICULUM IN CIVIL ENGINEERING

Freshman Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 2—Trig. and Algebra	5	Math. 4—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem.	5	Chem. 2—Gen. Inorganic Chem.	3
M.E. 1—Engr. Drawing	3	M.E. 2—Descript. Geometry	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M.S. 1—Military Science	R	C.E. 60—Engr. Surveys	3
P.E. 1—Physical Ed.	R	M.S. 2—Military Science	R
First Year Conference	<u>R</u>	P.E. 2—Physical Ed.	R
	16	First Year Conference	<u>R</u>
			17

Sophomore Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 5—Calculus	5	Math. 10—Calculus	3
Phys. 3—Gen. Physics	5	Phys. 4—Gen. Physics	5
Engl. 75—Public Speaking	3	C.E. 50—Statics	3
Econ. 10—Industrial Economics	3	C.E. 61—Higher Surveying	4
C.E. 82—Engr. Materials	2	Geol. 2—Physical Geology	3
M.S. 3—Military Science	R	M.S. 4—Military Science	R
P.E. 3—Physical Ed.	<u>R</u>	P.E. 4—Physical Ed.	<u>R</u>
	18		18

Junior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
C.E. 101—Mech. of Materials	4	C.E. 121—Struct. Steel Design	2
C.E. 112—Route Surveys	4	C.E. 122—Reinforced Concrete	2
C.E. 120—Structural Stresses	3	C.E. 133—Plain Concrete	2
C.E. 140—Hydraulics	3	C.E. 141—Hydraulic Engr.	3
E.E. 99—Fund. of Elec. Mach.	<u>3</u>	M.E. 99—Heat Engines	3
	17	Engl. 103—Gen. Literature	3
		M.E. 118—Dynamics	<u>3</u>
			18

Senior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
C.E. 135—Highway Engr. I	3	C.E. 167—Constr. and Cont'ing	3
C.E. 165—Engr. Admin.	3	C.E. 174—Structural Design II	4
C.E. 172—Foundations	2	C.E. 193—Sanitary Engineering	3
C.E. 173—Structural Design I	3	*Elective	3
C.E. 187—Transportation	2	Elective	4
C.E. 192—Water Supply	2	Senior Conference	R
Elective	2	Inspection Trip	<u>R</u>
Senior Conference	<u>R</u>		17
	17		

*Hist. 110 Recent United States History or Phil. 112 American Ideals.

CURRICULUM IN ELECTRICAL ENGINEERING

Freshman Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 2—Trig. and Algebra	5	Math. 4—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem	5	Chem. 2—Gen. Inorganic Chem	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M.E. 1—Engr. Drawing	3	M.E. 2—Descript. Geometry	3
M.S. 1—Military Science	R	M.E. 60—Machine Tool Oper	3
P.E. 1—Physical Ed	R	M.S. 2—Military Science	R
First Year Conference	<u>R</u>	P.E. 2—Physical Ed	R
	16	First Year Conference	<u>R</u>
			17

Sophomore Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 5—Calculus	5	Math. 100—Calculus	5
Phys. 3—Gen. Physics	5	Phys. 4—Gen. Physics	5
C.E. 82—Engr. Materials	2	C.E. 50— Statics	3
Econ. 10—Industrial Economics	3	E.E. 50—Elec. Circ. and Mach.	5
Engl. 75—Public Speaking	3	M.S. 4—Military Science	R
M.S. 3—Military Science	R	P.E. 4—Physical Ed.	<u>R</u>
P.E. 3—Physical Ed	<u>R</u>		18
	18		

Junior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
E.E. 110—A-C Circuits	4	E.E. 149—A-C Machinery	4
M.E. 99—Heat Engines	3	M.E. 101—Engr. Thermodyn	3
M.E. 118—Dynamics	3	M.E. 119—Kinematics of Mach	3
C.E. 101—Mech. of Materials	4	M.E. 141—Mech. Laboratory	2
Hist. 110—Recent U.S. History	3	Phys. 104—Elec. Measurements	3
	<hr style="width: 100%;"/>	Non-Tech. Elective	<u>3</u>
	17		18

Senior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
E.E. 150—A-C Machinery	4	E.E. 151—Commutat. Mach	3
E.E. 170—Wire Communication	4	E.E. 160—Power Trans. and Dist.	4
E.E. 180—Electronics—Tubes	4	Engl. 103—Gen. Literature	3
C.E. 140—Hydraulics	3	Elective	6
Elective	3	Senior Conference	R
Senior Conference	<u>R</u>	Inspection Trip	<u>R</u>
	18		16

CURRICULUM IN MECHANICAL ENGINEERING

Freshman Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 2—Trig. and Algebra	5	Math. 4—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem.	5	Chem. 2—Gen. Inorganic Chem	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M.E. 1—Engr. Drawing	3	M.E. 2—Descript. Geometry	3
M.S. 1—Military Science	R	C.E. 60—Engr. Surveys	3
P.E. 1—Physical Ed	R	M.S. 2—Military Science	R
First Year Conference	<u>R</u>	P.E. 2—Physical Ed	R
	16	First Year Conference	<u>R</u>
			17

Sophomore Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 5—Calculus	5	Math. 100—Calculus	5
Phys. 3—Gen. Physics	5	Phys. 4—Gen. Physics	5
Econ. 10—Industrial Economics	3	Engl. 75—Public Speaking	3
C.E. 82—Engr. Materials	2	C.E. 50—Statics	3
M.E. 60—Machine Tool Oper.	3	M.E. 99—Heat Engines	3
M.S. 3—Military Science	R	M.S. 4—Military Science	R
P.E. 3—Physical Ed	<u>R</u>	P.E. 4—Physical Ed	<u>R</u>
	18		19

Junior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Engl. 102—Gen. Literature	3	Hist. 110—Recent U.S. History	3
E.E. 99—Fund. of Elec. Mach.	3	E.E. 100—Fund. of Elec. Mach.	3
C.E. 101—Mech. of Materials	4	M.E. 102—Engr. Thermodyn	3
M.E. 101 Engr. Thermodyn	3	M.E. 110—Metal Processing	3
M.E. 118—Dynamics	3	M.E. 119—Kinematics of Mach.	3
M.E. 141—Mechanical Lab.	<u>2</u>	M.E. 142—Mechanical Lab.	<u>2</u>
	18		17

Senior Year

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
C.E. 140—Hydraulics	3	Phil. 112—American Ideals	3
M.E. 103—Steam Power Plants	3	M.E. 121—Mech. Engr. Design	3
M.E. 120—Machine Design	3	M.E. 134—Industr. Management	3
M.E. 143—Mechanical Lab.	2	M.E. 144—Mechanical Lab.	2
*Technical Elective	3	*Technical Elective	3
Elective	3	Elective	2
Senior Conference	<u>R</u>	Senior Conference	R
	17	Inspection Trip	<u>R</u>
			16

*Technical Electives

During the senior year, 6 credit hours are required from the following technical electives:

- 150f and w—Special Problems in Mechanical Engineering (2-4)
- 151w—Internal Combustion Engines (3)
- 153f—Refrigeration Systems (3)
- 154w—Refrigeration Plants (3)
- 155f—Heating and Air Conditioning (3)
- 156w—Heating and Air Conditioning Design (3)
- 157f—Factory Production (3)
- 158w—Factory Design (2)
- 160w—Advanced Mechanical Design (3)
- 170f and w—Aeromechanics (3)
- 190w—Steam Turbines (3)

In 1940, graduate study in engineering had not yet been developed. In fact, the only statement in the catalog was: "The College recognizes the needs of pure science and industry and advanced engineering practice for men skilled in analysis and scientific research. The special library and laboratory facilities provided, and the privilege of association with those of the staff who have records of accomplishments, offer full opportunity in this direction," that is, for graduate study. No special graduate courses were listed in the catalog, and prospective graduate students were advised to discuss the matter with the various department chairmen.

In 1932, a council to enhance the status of the engineer and the engineering profession was formed. The organization was called the Engineers Council for Professional Development (ECPD). It consisted of representatives from the American Institute of Chemical Engineers, American Institute of Mining Engineers, American Society for the Promotion of Engineering Education, American Institute of Electrical Engineers, American Society of Civil Engineers, and the American Society of Mechanical Engineers.

Among other important committees of ECPD was the "Committee on Engineering Schools," which was organized to study engineering curricula, specify in general terms the minimum requirements for accrediting a specific curriculum for a four or five-year undergraduate engineering college, and make annual reports to ECPD on the curricula so accredited. Members of the committee began visiting various engineering colleges for accrediting purposes in 1936.

In 1937, representatives of the curricula committee visited Columbia with the result that the civil, electrical, and mechanical engineering curricula were accredited for the maximum length of time, five years. At the end of the five-year period, and perhaps sooner, the curricula had to be reinspected. The civil, electrical and mechanical engineering curricula have been accredited since the beginning of this important ECPD activity. The chemical engineering curricula was accredited in 1940, and the industrial engineering in 1962.

The United States actively entered World War II on December 7, 1941, and the College of Engineering faculty immediately tackled the difficult task of adapting its activities and curricula to wartime needs. For example, the faculty voted to operate the College on a 12-month basis, including two 18-week semesters and a 12-week summer session.

A civilian pilot training program was undertaken from 1939 to 1943, in which trainees were carefully selected, after a rigorous physical examination, and given both ground school and flight training in light planes. About 90 students a year were enrolled in the program during 1940 and 1941. A special training course was given for machine tool operators, as there was a great shortage of those skilled in this craft. Eventually, 283 men and 18 women were trained in this program and placed in the war industries. A special program for training water works operators was repeated.

In the fall of 1940, the requirements for the MS degree included residence work of two semesters or 32 semester hours, of which 16 hours had to be in courses numbered 200 and above. Courses numbered below 100 did not receive graduate credit. Courses numbered from 100 to 200 were open to both seniors and graduate students while those numbered 200 and above were open to grad-

uate students only. The PhD degree required a minimum of six semesters in residence, the completion of a dissertation, the passing of a reading examination in French and German, the passing of a preliminary examination one year before the passing of a final oral and written final examination.

In agricultural engineering, courses numbered in the 100 group were: Farm Buildings, Farm Building Design, Farm Power and Machinery, Drainage and Erosion Control, Irrigation and Drainage, and Special Problems. The courses offered in the 200 group were: Seminar, Farm Mechanical Special Investigations, and Research.

In chemical engineering, courses in the 100 group were: Elements of Chemical Engineering, Principles of Chemical Engineering, Special Problems, Chemical Engineering Project, Thermodynamics, and Plant Design. The 200-course group included: Seminar, Instrumentation, Fuels and Combustion, Petroleum Technology, Heat Transfer and Fluid Flow, Drying and Humidification, Distillation and Rectification, Extraction, Mechanical Separation, Economics, Equipment, Process Development and Plant Design, Mathematical Studies of Processes, Special Studies and Research.

In civil engineering, the courses in the 100 group were: Route Surveys, Structural Stresses, Structural Steel, Hydraulic Engineering, Advanced Hydraulics, Sanitary Analysis, Soil Mechanics, Mechanics of Materials, Economy of Railway Operation, Engineering Administration, Construction and Contracting, Foundation and Masonry Construction, Structures Design, Indeterminate Structures, Road Materials, Special Problems, Highway Engineering, Water Supply, Sanitary Engineering, and Sanitation. The courses numbered 200 and above were: Seminar, Theory of Elasticity, Engineering Administration, Structural Theory and Design, Reinforced Concrete, Highway Transportation, Hydraulic Engineering, Special Studies, Sanitary Science, and Research. (An option in Sanitary Engineering was approved by the faculty in 1939.)

The courses in electrical engineering in the 100 group were: Alternating Current Circuits, Alternating Current Machinery, Commutating Machinery, Power Transmission, Wire Communications, Electronics and Electron Tubes, Radio Communications, and Special Problems. The courses in the 200 group were: Seminar, Electrical Machinery Theory, Electric Circuits, High Voltage Transmission, Power Rectification Inversion and Control, Circuit Analysis, Special Studies, and Research.

In mechanical engineering, the 100-group courses were: Thermodynamics, Steam Power Plants, Kinematics of Machines, Machine Design, Mechanical Design, Mechanical Laboratory, Economic Studies, Industrial Management, Internal Combustion Engines, Special Problems, Refrigerated Systems, Refrigerated Plants, Heating and Air Conditioning, Factory Production, Factory Design, Mechanical Design, Aeromechanics, Steam Turbines. The courses in the 200 group were: Thermodynamics, Combustion, Refrigeration, Special Studies, and Research.

In the spring of 1942. Professor Rubey administered a statewide program financed by the Federal Government called the "Engineering Science and Management War Training" (ESMWT). This was a program to upgrade trainees in these basic fields essential for war activities, and was offered in 10 industrial centers in the state with the assistance of the University Extension Division.

Professor Rubey also organized and administered a Diesel Operators Training School for the U.S. Navy. In this undertaking, begun in October 1942 and concluded in August 1943, some 5,000 men selected by the Navy were trained in the operation and care of light diesel engines used in landing craft. About 40 men were employed on the teaching staff, of whom some were experienced U.S. N. operators, and others, civilians.

Because of the shortage of engineers knowledgeable in radio in 1942, the engineering faculty permitted senior electrical engineering students to leave in February of that year to attend a special training program for junior radio engineers at Lexington, Kentucky. There, if the special course were completed successfully, they would receive their BS degree in electrical engineering in June 1942. The faculty voted in May 1942, to permit seniors to leave May 16 and receive their degrees, if they were to enter the armed services or be employed in war industries. Eight semester hours credit for advanced ROTC was a substitute for cultural courses.

In 1943, the University adopted the quarter system, as the troops being trained by the University moved according to the armed forces' quarterly scheduling, but this existed only until troops were withdrawn at the end of the year. Also, eight courses for radio operators were offered and in February a course for women radio operators was undertaken for the Civil Service and the U.S. Signal Corps. Thirty-five women, of the 60 who started the program, successfully completed the course.

During the 1942-43 war period, no graduate students remained in the College and all engineering graduate study and research was discontinued. Plans for receiving some 600 Army Specialized Training Program (ASTP) students were being formulated. This program was to train men, who had already had some college training in engineering or science, in an advanced course. Those who had completed lower level work and had been selected by testing for aptitude were to be placed in a basic course. Some 200 men were expected for the advanced course while 400 were expected for the basic course. However, selection by the Army was not carefully conducted, and as a result in October, 1943, the enrollment was 339 in the advanced course and 865 in the basic course. After extended effort on the part of the faculty to organize the curricula, course content, and class schedules in an acceptable engineering educational program, the ASTP was discontinued in April 1944. Although the program had not been completed, troops were needed on the critical German Front. About 45 men in the A-12 Program were permitted to remain. Frequent changes in the interpretation of the Selective Service Act caused many difficulties for the civilian students and the faculty, and by fall of 1944, the civilian enrollment had dropped to approximately 100 men.

In February of 1943, the faculty voted to admit five Japanese students from California, and in December of that year they voted to have the same course schedule for both ASTP and civilian students. The committee of deans also voted to rescind the rule that senior work must be done in residence, to expedite graduation of returning veterans.

The Germans surrendered on May 4, 1945, followed by the surrender of the Japanese on September 2, 1945. Now, the College was faced with the difficult

task of receiving large numbers of students who would be returning to complete their degrees. This flood of enrollments was stimulated by the passage of the G.I. "Bill of Rights", which financed an educational program for veterans, based on the length of time they spent in the armed services.

During the 1944-45 academic year, Dean Harry Curtis announced the following objectives for the post-war period:

- (1) Strengthen undergraduate work.
- (2) Re-establish graduate work.
- (3) Restore and enhance the activities of the Experiment Station.
- (4) Stress the recruitment of a superior faculty.
- (5) Obtain funds for sorely needed expansion of the physical plant and equipment.

To accommodate the work load of the faculty to the large postwar enrollment expected, the faculty voted, in November 1945, to remove the required senior conference, freshman conference, and inspection trip from the list of necessary graduation requirements.

In 1946, the U.S. Navy introduced a program for Reserve Officer Training. Military Science courses for the Army had been introduced on a voluntary basis in 1868. Various military training programs, both voluntary and required, with or without credit toward a degree, were offered. However, in 1932, a U.S. Supreme Court ruling was generally interpreted as requiring all male students to take ROTC training at land-grant colleges. Accordingly, in 1946, both the Army and the Navy ROTC 2-year programs were offered, but no credit toward a degree was given for the first two years of those required courses.

In the winter semester of 1945, the enrollment had increased to over 600 from the 1944 fall semester's 100 (See graph on page 54). This flood of enrollments affected all engineering colleges and, as a result, a critical shortage of text books, slide rules, and drawing instruments existed. Even more critical was the fact that laboratory space was rapidly becoming inadequate.

In June of 1947, the faculty voted to return to the prewar summer school schedule of eight weeks, reducing the wartime's 12-week summer session. This became effective beginning with the 1946 summer session.

The curricula for the fall semester of 1950 were as follows (compare with those for 1940 beginning on page II-1a):

1950

CURRICULUM IN AGRICULTURAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 9—Trigonometry	2	Math. 11—Analytic Geometry	5
Math. 10—Algebra	3	Chem. 15—Organic Chem.	3
Chem. 1—Gen. Inorganic Chem.	5	Engl. 2—Comp. and Rhetoric	3
Engl. 1—Comp. and Rhetoric	3	M.E. 10—Descrip. Geometry	3
M.E. 1—Engr. Drawing	3	A.E. 10—Farm Shopwork or M.E. 80 and	
M.S. 1—Military Science	R	M.E. 81—Machine Tool Operations	3
P.E.—Physical Education	<u>R</u>	M.S. 2—Military Science	R
	16	P.E. 2—Physical Education	<u>R</u>

17

CURRICULUM IN CHEMICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 9—Trigonometry	2	Math. 11—Analytic Geometry	5
Math. 10—Algebra	3	Chem. 2—Gen. Inorganic Chem	3
Chem. 1—Gen. Inorganic Chem	5	Chem. 26—Qualitative Analysis	2
Engl. 1—Comp. and Rhetoric	3	Eng. 2—Comp. and Rhetoric	3
M.E. 1—Engineering Drawing	3	M. E. 10—Descriptive Geometry	3
M.S. 1—Military	R	M. S. 2—Military	R
P.E. 1—Physical Education	<u>R</u>	P. E. 2—Physical Education	<u>R</u>
	16		16

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math. 25—Calculus I	5	Math. 201—Calculus II	5
Chem. 210—Organic Chemistry (Lect.)...	3	Chem. 212—Organic Chemistry	3
Chem. 221—Quan. Chem. Analysis	3	Phys. 24—General Physics	5
Phys. 23—General Physics	5	Econ. 41—Industrial Economics	3
Speech 75—Public Speaking	3	Ch. E. 223—Chem. Technology I	2
M. S. 3—Military	R	M. S. 4—Military	R
P. E. 5—Physical Education	<u>R</u>	P. E. 6—Physical Education	<u>R</u>
	19		18

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
Chem. 231—Physical Chemistry	3	Chem. 233—Physical Chemistry	3
Chem. 232—Physical Chem. Lab	2	Ch. E. 204—Chem. Engr. Materials	2
Ch. E. 225—Chem. Process Calculations I ...	3	Ch. E. 226—Chem. Process Calculations II ...	3
Ch. E. 234—Prin. of Ch. E. I	3	Ch. E. 235—Prin. of Ch. E. II	3
M. E. 90—Analytic Mechanics	4	C. E. 101—Mech. of Materials	3
Humanistic-Social Studies	<u>3</u>	C. E. 102—Mech. of Matls. (Lab.)	1
	18	Humanistic-Social Studies	<u>3</u>
			18

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
Ch. E. 236—Prin. of Chem. E. III	3	Ch. E. 362—Ch. E. Thermodynamics II ...	3
Ch. E. 243—Chem. Engr. Lab. I	2	Ch. E. 386—Chem. Plant Design II	2
Ch. E. 361—Chem. Engr. Thermo. I	3	*Ch. E. 244—Chem. Engr. Lab. II	2
Ch. E. 385—Chem. Plant Design I	3	E. E. 121—Fund. of Electrical Machinery (Lect.)	2
E. E. 119—Fund. of Electrical Machinery (Lect.)	2	E. E. 122—Fund. of Electrical Machinery (Lab.)	1
E. E. 120—Fund. of Electrical Machinery (Lab.)	1	Humanistic-Social Studies	3
Humanistic-Social Studies	<u>3</u>	Elective	3
	17	Inspection Trip	R
			16

*In special cases, Ch. E. 251 may be substituted for Ch. E. 244 upon approval of a detailed project by the department.

CURRICULUM IN THE SANITARY OPTION, DEPARTMENT OF CIVIL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 9—Trigonometry	2	C. E. 20—Engr. Surveys	3
Math. 10—Algebra	3	Math 11—Analytic Geometry	5
Chem. 1—Gen. Inorganic Chem	5	Chem. 2—Gen. Inorganic Chem	3
M. E. 1—Engr. Drawing	3	M. E. 10—Descript. Geometry	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M. S. 1—Military	R	M. S. 2—Military	R
P. E. 1—Physical Education	<u>R</u>	P. E. 2—Physical Education	<u>R</u>
	16		17

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Chem. 26—Qualitative Analysis	2	Chem. 221—Quan. Chem. Anal	3
Math. 25—Calculus I	5	Math. 201—Calculus II	5
Phys. 23—Gen. Physics	5	Phys. 24—Gen. Physics	5
Econ. 41—Industrial Econ	3	C. E. 50—Statics	3
Speech 75—Public Speaking	3	M. S. 4—Military	<u>R</u>
M. S. 3—Military	R	P. E. 6—Physical Education	<u>R</u>
P. E. 5—Physical Education	<u>R</u>		16
	18		

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
Bot. 202—Gen. Bacteriology	3	C. E. 221—Struct. Steel Design	3
Chem. 210—Organic Chemistry	3	C. E. 222—Reinforced Concrete	3
C. E. 101—Mech. of Materials	3	C. E. 240—Fluid Mechanics	3
C. E. 102—Mech. of Matls. (Lab.)	1	C. E. 241—Fluid Mech. (Lab.)	1
C. E. 155—Dynamics	2	C. E. 341—Hydraulic Engr.	3
C. E. 220—Struct. Stresses	3	Bact. 203—Sanitary Bact.	3
Humanistic-Social Studies	<u>3</u>	Humanistic-Social Studies	<u>2</u>
	18		18

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
C. E. 212—Route Surveys	4	Chem. 230—Physical Chem	3
C. E. 372—Found. & Mas. Const	3	Ch. E. 225—Chem. Process Cal I	3
C. E. 348—Sanitary Engr	2	C. E. 293—Sewerage	3
C. E. 292—Water Supply I	2	C. E. 273—Struct. Design	3
C. E. 365—Engr. Administration or	3	E. E. 120—Fund. of Elect. Mach	3
C. E. 367—Const. & Contr'ing.		Humanistic-Social Studies	3
Humanistic-Social Studies	<u>3</u>	Inspection Trip	<u>R</u>
	17		18

CURRICULUM IN ELECTRICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 9—Trigonometry	2	Math. 11—Analytic Geometry	5
Math. 10—Algebra	3	Chem. 2—Gen. Inorg. Chemistry	3
Chem. 1—Gen. Inorg. Chem.	5	Engl. 2—Comp. and Rhetoric	3
Engl. 1—Comp. and Rhetoric	3	M. E. 10—Desc. Geometry	3
M. E. 1—Engineering Drawing	3	Humanistic-Social Study	3
M. S. 1—Military Science	R	M. S. 2—Military Science	R
P. E. 1—Physical Education	<u>R</u>	P. E. 2—Physical Education	<u>R</u>
	16		17

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math. 25—Calculus I	5	Math. 201—Calculus II	5
Phys. E23—General Physics	5	Physics E24—General Physics	5
C. E. 82—Eng. Materials	2	E. E. 150—Elem. of Elec. Engr	5
Econ. 41—Industrial Economics	3	Speech 75—Public Speaking	3
M. E. 80—Machine Tool Oper	3	M. S. 4—Military Science	R
M. S. 3—Military Science	R	P. E. 6—Physical Education	<u>R</u>
P. E. 5—Physical Education	<u>R</u>		18
	18		

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
E. E. 210—A. C. Circuit Theory	4	E. E. 275—Transmission Circuits	3
E. E. 240—Elect. Machinery I	4	E. E. 249—Elect. Machinery II	5
M. E. 90—Analytic Mechanics	4	E. E. 280—Electronics	3
Phys. 304—Elect. Measurements	3	M. E. 99—Heat Engines	3
Humanistic-Social Study	<u>3</u>	C. E. 101—Mech. of Materials	3
	18	C. E. 102—Mech. of Materials (Lab.)	<u>1</u>
			18

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
C. E. 240—Fluid Mechanics	3	M. E. 230—Thermodynamics	3
E. E. 315—Transients	3	M. E. 241—Mech. Laboratory	2
E. E. 320—Vacuum Tube Circuits	4	Free Elective	3
Technical Elective	3	Technical Elective	6
Humanistic-Social Study	<u>3</u>	Humanistic-Social Study	3
	16	Inspection Trip	<u>R</u>
			17

At least 6 credit hours must be chosen from the following list of technical electives:

<i>Hours</i>	
E. E. 290—Illumination	3
E. E. 355—Elec. Machinery III	3
E. E. 300—Special Problems	2-4
E. E. 330—Radio Circuit Analysis	3
E. E. 340—UHF Techniques	3
E. E. 370—Power Transmission and Distribution	3
E. E. 360—Control Systems	3

CURRICULUM IN MECHANICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 9—Trigonometry	2	Math. 11—Analytic Geometry	5
Math. 10—Algebra	3	Speech 75—Public Speaking	3
Chem. 1—General Inorg. Chem.	5	Chem. 2—General Inorg. Chem.	3
Engl. 1—Comp. and Rhetoric	3	Engl. 2—Comp. and Rhetoric	3
M.E. 1—Engineering Drawing	3	M.E. 10—Descriptive Geometry	3
M.S. 1—Military	R	M.S. 2—Military	R
P.E. 1—Physical Education	<u>R</u>	P.E. 2—Physical Education	<u>R</u>
	16		17

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math. 25—Calculus I	5	Math. 201—Calculus II	5
Phys. 23—General Physics	5	Phys. 24—General Physics	5
M.E. 80—Mach. Tool Operations	3	M.E. 99—Heat Engines	3
Econ. 41—Industrial Economics	3	M.E. 90—Analytical Mechanics	4
C.E. 82—Engr. Materials	2	M.S. 4—Military	R
M.S. 3—Military	R	P. E. 4—Physical Education	<u>R</u>
P.E. 3—Physical Education	<u>R</u>		17
	18		

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
M.E. 205—Kinematics of Mach.	3	M.E. 210—Dynamics of Mach.	2
M.E. 241—Mechanical Lab.	2	M.E. 242—Mechanical Lab.	2
M.E. 230—Engineering Thermo- dynamics	3	M.E. 330—Engineering Thermo- dynamics	3
M.E. 310—Metal Processing	3	C.E. 101—Mechanics of Materials (Lecture)	3
E.E. 119—Fund. of Electrical Machinery (Lecture)	2	C.E. 102—Mechanics of Materials	
E.E. 120—Fund. of Electrical Machinery (Lab.)	1	E. E. 122—Fund of Electrical Machinery (Lab.)	1
Humanistic-Social Studies	<u>3</u>	E.E. 121—Fund. of Electrical Machinery (Lab.)	1
	17	Humanistic-Social Studies	<u>3</u>
			17

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
M.E. 220—Machine Design	3	M.E. 221—Mech. Engr. Design	3
M.E. 243—Mechanical Lab.	2	M.E. 244—Mechanical Lab.	2
M.E. 351—Steam Power Plants	3	C.E. 343—Hydraulic Mach.	3
*Technical Elective	3	*Technical Elective	3
Humanistic-Social Studies	3	Humanistic-Social Studies	3
Elective	4	Elective	4
	18	Inspection Trip	<u>R</u>
			18

It will be noticed that the required, no-credit freshman and senior conferences and the inspection trip of 1940 had disappeared.

In 1940, graduate students would be admitted to the graduate college if they had received a BS degree with satisfactory grades from an accredited engineering college. Candidates for a graduate degree, however, also had to be approved by the engineering department of their major study.

The requirements for the MS degree were 32 semester hours of work with satisfactory grades. Sixteen semester hours of this course work had to be in courses numbered 200 and above, which were for graduate students only. Courses numbered from 100 to 199 were taken by both seniors and graduate students. Courses numbered below 100 received no graduate credit.

The PhD degree required a minimum of 6 semesters of study in residence, completion of a research project, passing of a preliminary examination one year before a final examination, and completion of a dissertation on the research project. A reading knowledge of French and German also had to be demonstrated.

In 1950, college entrance requirements were 15 units of high school work, including: three units in English, three in mathematics and one unit in laboratory science. The three units in mathematics were to include one and one-half units of algebra, one unit of plane geometry and one-half unit of solid geometry. Students deficient in mathematics could make up this deficiency in the University, but would receive no credit toward their degree for such work. The applicant had to have graduated from an accredited high school with satisfactory grades, or have passed special aptitude tests or entrance examinations in certain subjects. Veterans would be admitted after scoring satisfactorily in the General Education Development Test of the Armed Forces Institute, in addition to some subject matter tests.

In 1950, the requirements for studying toward the MS degree and the PhD degree were practically the same as those in 1940 (see page II - 11). The course numbering system was changed, however. Courses numbered 400 and above were for graduate students only, and courses numbered 300 to 399 were for seniors and graduate students. Thirty-two semester hours of course work were required for the MS degree, half of which had to be in courses numbered 400 and above.

In agricultural engineering, courses in the 300 group were: Special Problems, Farm Building Design, and Home and Farmstead Improvement. The graduate courses numbered in the 400 group were: Special Investigations, Seminar and Research.

In chemical engineering, courses in the 300 group were: Special Problems, Chemical Technology, Petroleum Technology, Thermodynamics, Instrumentation, and Plant Design. Courses in the 400 group were: Special Investigations, Seminar, Fuels and Furnaces, Heat Transfer and Fluid Flow, Drying and Humidification, Distillation, Extraction and Mechanical Separation, Chemical Economics, Research, Advanced Thermodynamics, Process and Plant Design, and Mathematical Studies of Operations.

In civil engineering, courses in the 300 group were: Special Problems, Hydraulic Engineering, Advanced Hydraulics, Hydraulic Machinery, Sanitary Engineering, Sanitary Analysis, Advanced Mechanics of Materials, Soil Mechanics, Engineering Administration, Construction and Contracting, Foundations and

Masonry Construction, Structural Design, Statically Indeterminate Structures, Road Materials, Highway Engineering, and Transportation. The courses in the 400 group were: Special Investigations, Theory of Elasticity, Theory of Plates and Shells, Elastic Stability, Seminar, Structural Theory, Reinforced Concrete Theory, Concrete, Methods of Investigation, Soil Mechanics, Highway Transportation, Hydraulics Engineering, Water Supply, Public Health Engineering, Sanitary Engineering and Research.

In electrical engineering, the courses in the 300 group were: Special Problems, Transients in Circuits, Vacuum Tubes, Ultrahigh Frequency Circuits, Electrical Machinery, Control Systems, and Power Transmission. In the 400 group, courses were: Special Investigations, Seminar, Electrical Machinery Theory, Power Systems, Advanced Electronics, Research, Advanced Circuit Analysis, Operational Circuit Analysis, High Frequency Transmission and Radiation, and Research.

In mechanical engineering, courses offered in the 300 group for both seniors and graduate students were: Special Problems, Metal Processing, Mechanical Design, Engineering Kinetics, Thermodynamics, Heating and Air Conditioning, Instrumentation, Steam Power Plants, Steam Turbines, Economic Studies, Internal Combustion Engines, Refrigeration, Factory Production, and Aeromechanics. The 400 courses for graduate students only were: Seminar, Mechanical Vibrations, Dynamic Theory, Flow of Compressible Fluids, Thermodynamics, Psychrometry, Industrial Air Conditioning, Research, Combustion, Heat Exchangers, Refrigeration, and Machine Tool Processes.

In September of 1950, the faculty voted to allow up to eight semester hours of credit, if needed, for the completion of the advanced course in Army, Navy and Air Force ROTC with satisfactory grades.

In November of 1951, the faculty approved an industrial engineering option in mechanical engineering consisting of 18 semester hours for each semester of the junior and senior years. Courses in Engineering Management and Personnel Administration were introduced in the Mechanical Engineering Department about 1907. In 1939 and 1940, Factory Production and Factory Design were introduced. All of the courses in industrial engineering had been dropped during the war years.

During 1950-51, the short courses and conferences offered by the College were: Diesel Power Plants, Traffic Engineering, Better Concrete, and Water Works.

The curriculum in agricultural engineering received ECPD accrediting in 1952, making all curricula offered at that time fully accredited.

In the fall of 1952, a no-credit freshman orientation course consisting of one hour-long lecture per week was required of all freshmen. Lectures on the history of engineering, the professional societies, ethics, etc., were given by the Dean. Later, department chairmen described various interesting applications of science in their particular fields. This course was discontinued in the fall of 1961.

In the fall of 1954, University classes were to begin at 7:40 a.m. due to a shortage in classroom space. At that time, co-op programs with the Gas Turbine Plant of Westinghouse at Kansas City and the State Highway Department were begun. Short courses and conferences were held in Diesel Engines, Air Conditioning, Highways, Water Works, Television, Power Distribution, Traffic Engineering, Structural Engineering, and Water Works.

The usual activities of St. Pat's Week were expanded in March 1956 to celebrate 100 years of education in the College of Engineering. Brewer Field House was filled with displays of industrial machines and scientific instruments, and a two-day conference on the future of engineering was held in Jesse Auditorium. The impressive list of speakers and the topics included Mr. A. A. Kucher, director of the scientific laboratories of the Ford Motor Co., "American Industry of the Future"; Mr. C. Y. Thomas, vice-president in charge of operations of the Spencer Chemical Co., "Research of the Future"; Mr. O. B. Falls, marketing manager at the Atomic Power Department, General Electric Co., "Power Generation"; Mr. Eugene J. McNeely, executive vice-president of American Telephone and Telegraph Co., "Communications of the Future"; Mr. Wilbert G. Fritz, consultant to the Office of Defense Mobilization, "The Future of Our Natural Resources"; Mr. Frederick H. Roerer, administrative engineer, McDonnell Aircraft Corp., "Air Transportation in the Foreseeable Future"; Rex M. Whitton, chief engineer of the Missouri Highway Commission, "Highway Transportation of the Next 100 years"; Mr. W. M. Keller, executive vice-chairman of the American Association of Railroads, "Railroading in 2056"; and Brigadier General W. E. Potter, U. S. Army Corps of Engineers, "The Nation's Inland Waterways System."

In the fall of 1956, Descriptive Geometry was dropped from the curriculum in chemical engineering, and Machine Tool Operations and Engineering Materials (CE 82) were dropped from the electrical engineering curriculum. Short courses and conferences were; Air and Water Pollution, Water Works, Air Conditioning and Traffic Engineering. In May of 1957, the first report of the Nuclear Energy Committee was presented to the faculty.

In October 1957, the faculty voted to allow three semester hours credit for completion of the Advanced ROTC courses requiring eight semesters, plus an additional three hours credit, if needed for graduation (or a maximum of six semester hours credit for these courses). During this period, the senior inspection trip was dropped as a requirement for graduation in civil and electrical engineering.

The faculty approved the granting of advanced standing by examination for entering freshmen beginning in the fall of 1958.

In April of 1958, the faculty voted to discontinue the industrial engineering option in mechanical engineering, and to form a Department of Industrial Engineering to which the industrial engineering courses would be transferred. This option was initiated in 1951. To these transferred courses, a sufficient array of new courses were added to offer a complete curriculum in industrial engineering. The new BS degree in Industrial Engineering was approved by the faculty, the President of the University, and the Board of Curators in May, 1958. In June, a combined five-year course in Industrial Engineering and the School of Business and Public Administration was introduced. Completing this, the student would receive his BS degree in both industrial engineering and business. Short courses and conferences held during the year included: Air and Water Pollution, Traffic Engineering, Water Works, Utilization of Engineers, and Refrigeration.

In June 1959, the MS degree in Industrial Engineering and Sanitary Engineering was approved by the faculty. After the usual five-year period, the ECPD inspection committee for accrediting curricula visited the College and re-accredited

all curricula except that in industrial engineering, which was not ready for inspection because no class had graduated in that curriculum. Short courses and conferences during the 1958-59 period included: Air and Water Pollution, Water Works, Traffic Engineering, Instrumentation, Meter Readers (for the National Electric Light Assn.), and the Mid-Missouri Development Council.

The faculty had approved a program, and the first course in nuclear engineering was to be taught in the Mechanical Engineering Department in April, 1955. This was followed by a course titled Nuclear Fuels, taught in chemical engineering in 1956, and the course Radioisotope Techniques, taught in chemical engineering in 1959. The staff believed that the nuclear engineering degree should be on the graduate level only, and that the courses approved would permit seniors from all departments of engineering to take these offerings and thus be prepared for graduate study.

The short courses and conferences given during the 1959-60 period were: Traffic Engineering, Sanitary Engineering, Water Softening, Water Plant and Sewage Plant Operators, Air and Water Pollution, Utilization of Engineers, and Manufacturing Management.

In 1960-61, the National Science Foundation (NSF) supported a summer school for 40 selected engineering teachers from junior colleges and four-year liberal arts schools all over the country. A special grant of \$56,000, under the National Defense Education Act, was made to the College to train four carefully-selected BS graduates to complete the PhD degree. The short courses and conferences held during this period were: Water and Sewage Plant Operators, Electric Meter Men, Refrigeration, and Air and Water Pollution.

Beginning in September, 1962, algebra and trigonometry were required for entering freshmen as prerequisite to beginning the mathematics sequence in the College. While these courses could be taken in the University, no credit would be granted toward the BS degree. The curriculum of the BS degree in Industrial Engineering was accredited by ECPD, making all BS degrees with department designation fully accredited by 1962. After discussing plans for adding digital and analog computer courses as early as December 1961, the faculty approved a new course in digital computer applications to all curricula in April, 1962.

In the fall of 1963, all freshmen were required to take Introduction to Computer Programming. An advanced course in programming was an elective in the junior year. An IBM 1620 computer was installed in the Electrical Engineering Building, with a battery of seven transistorized analog computers located in an adjacent room. Students were encouraged to use the computers as a tool in their course work.

The short courses and conferences held during the 1963-64 academic year included: Introduction to Analog Computers, Air and Water Pollution, Descriptive Geometry, Ready Mixed Concrete, Construction Control, Corrosion Control, Structural Engineering, Traffic Engineering, Stress Analysis, Plumbing Standards, Transportation and Planning, Water and Sewage Plant Operators, and Sanitary Engineers and Sanitarians.

In 1964, course work leading to the MS degree in Electrical Engineering was authorized to be taught by faculty from the College of Engineering, in Extension at Kansas City. A similar program for the MS in Civil Engineering was

also authorized beginning in January 1966. The Civil Engineering Department received an undergraduate training grant in water quality control, including completion of training for two graduate students toward the MS degree. In 1964, the faculty also approved the MS degree in Nuclear Engineering, and the BS requirement of at least 12 semester hours of humanistic and social studies, including at least one course in American history or in political science. The short courses and conferences held during the 1964-65 period were: Traffic Engineering, Water Quality, Non-Destructive Testing, Sanitary Engineering, Water and Sewage Plant Operators, Public Works Construction Inspectors, Computer Control Systems, and Community Development Agents.

In the 1964-65 academic year, the faculty voted to increase the social humanistic content of the curricula from 12 to 21 semester hours, with a concentration of study in one particular field. The faculty also discussed reducing the number of semester hours from 138 to 136 during this period, and voted to reduce the number of semester hours required for the MS degree from 32 to 30. When the Board of Curators voted to make all ROTC programs elective instead of requiring the first two years of training for all men, it ended a tradition begun in 1868, when one year of basic military training was required for all men. This became an optional program in 1879, and a two-year program in 1891 and 1908. In 1932, a U. S. Supreme Court ruling was interpreted as requiring all male students at land grant schools to take two years of military training. This policy was followed until the Board of Curators made Reserve Officer Training Corps (ROTC) programs elective. The ROTC program originated by the Army was expanded in 1948 to include the Navy and Marine Corps. The Air Force introduced its ROTC program in 1949.

During the 1965-66 academic year, the faculty voted to reduce the requirements for a BS degree from 138 to 136 semester hours, this reduction to be made by reducing the requirements in Analytical Geometry and Calculus. During the summer of 1966, a selected group of 130 high school seniors were brought to the campus for a special 3-week course in computer programming. This program was made possible by donations from 10 companies amounting to approximately \$8,500.

A special committee of the American Society for Engineering Education reported on "The Goals of Engineering Education" in October 1965. This report proposed various changes in engineering curricula to update it, following the end of World War II. After considerable discussion, the faculty recommended in March 1966: that the first degree in engineering be a BS with department designation, at the end of four years; that the Engineer's Council for Professional Development (ECPD) should accredit only academic degrees and not professional degrees; that the initial accrediting of a curriculum be rigorous, with succeeding ECPD checks satisfied by a report of the changes in faculty, curricula, and facilities instead of the voluminous report now required; and that accrediting continue to be for individual curricula only, not for the whole institution.

During 1966, the PhD degree in Nuclear Engineering was approved. A proposal for an MS degree in Environmental Science was discussed. This latter program was designed for those who had completed the BS degree in engineering, the life sciences, or the physical sciences. It would include courses in sanitary engineering, biology, and botany.

Short courses and conferences held during the 1965-66 period included: Sanitary, Engineering, Plumbing, Ready-Mixed Concrete, Construction Management, Water Works Operators, Timber Structures, and Engineering Training Refresher.

The 1966-67 academic year saw the introduction of the honors program in engineering, though it had been discussed by the faculty as early as 1962. The program could be elected at the end of the freshman year by students who had a minimum grade point average of 3.0 (B). Under this program, the student could take advanced courses, including honors courses which had been approved by the major department. An honors student could obtain his BS degree with a minimum of 124 semester hours of credit, and with the completion of 30 additional semester hours could obtain his MS degree. Thus an honors student could obtain his MS degree in one additional semester plus a summer session after receiving his BS degree.

In the 1966-67 period, the faculty discussed the introduction of a graduate program in bioengineering which would involve course work in engineering sciences, medicine, veterinary medicine, and arts and science. This program would be directed by staff from the colleges concerned.

On May 6, 1967, the faculty voted to change the name of the Mechanical Engineering Department to the Mechanical and Aerospace Engineering Department. This change was approved by the Board of Curators in November 1967. During this same year, the co-op programs with industry had expanded to include the following companies; Alco Valve Co., Allis-Chalmers Co., Alton Box Board Co., Century Electric Co., Collins Radio Co., Deere & Co., Emerson Electric Co., Ford Motor Co., General Motors Corp., McDonnell Co., Missouri Pacific Railroad, Phillips Petroleum Co., the Army Corps of Engineers, and the National Aeronautics and Space Administration.

In the fall of 1966, admission as a freshman to the College required graduation from an accredited high school with a satisfactory record, an official recommendation, and 15 units of high school work which were to include four units of English, three and one-half or four units of mathematics, and two units of laboratory science. The mathematics prerequisites were to include two units of algebra, one unit of plane geometry, one-half unit of solid geometry, and one-half unit of trigonometry. Entrance deficiencies in mathematics could be made up in the University but this work would not be credited toward a degree. Upon application, students could take examinations for advanced standing in mathematics, English, government, engineering drawing, and foreign languages, and, if these examinations were passed, receive credit toward a degree. Students having a 3.0 (B) or better grade point could enroll in the general honors courses for students of above-average ability. Admission to the University required that the student must have been in the upper two-thirds of his high school graduating class.

The curricula for the BS degree in the various departments in the fall of 1966 were as follows:

CURRICULUM IN AGRICULTURAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 80—Analytic Geom. & Calc. I	5	Math. 175—Analytic Geom. & Calc. II	5
Chem. 11—General Chemistry	5	Chem. 15—Elem. Organic Chemistry	3
Engl. 1—Composition	3	M. E. 10—Descriptive Geometry	3
M. E. 1—Engineering Drawing	3	Humanistic—Social Studies	6
A. E. 4—Computer Programming	1	P. E. 2—Physical Education	1
P. E. 1—Physical Education	1		

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math. 201—Analytic Geom. & Calc. III	5	Math. 301—Differential Equations	3
Phys. 23—General Physics	5	Phys. 24—General Physics	5
Bot. 1—General Botany	5	A. E. 241—Mech. of Farm Machines	3
A. E. 121—Engineering Surveying	2	C. E. 50—Statics	3
P. E. 5—Physical Education	1	Humanistic—Social Studies	3
		P. E. 6—Physical Education	1

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
C. E. 156—Dynamics	3	M. E. 302—Applied Thermodynamics	3
E. E. 119—Fund of Elec. Circuits	2	C. E. 101—Mech. of Materials	3
E. E. 120—Fund of Elec. Cir. Lab	1	C. E. 102—Mech. of Materials Lab	1
Soils 100—Soils	5	C. E. 240—Fluid Mechanics	3
A. E. 203—Farm Buildings	3	C. E. 241—Fluid Mechanics Lab	1
Engl. 60—Exposition	3	Technical Electives	3
or		Humanistic—Social Studies	3
Engl. 61—Technical Writing			

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
A. E. 221—Soil Conservation Engineering	3	A. E. 303—Farm Building Design	3
A. E. 351—Farm Elec. Engineering	3	A. E. 321—Irrigation and Drainage Engineering	3
A. E. 340—Adv. Farm Power & Mach	3	Technical Elective	3
Technical Elective	3	Humanistic—Social Studies	6
Humanistic—Social Studies	3	Elective	3
Speech 175—Public Speaking	3		

CURRICULUM IN CHEMICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 80—Analytic Geo. & Calculus I	5	Math. 175—Analytic Geo. & Calculus II	1
Chem. 11—Gen. Chem	5	Phys. 23—Gen. Physics	5
Engl. 1—Composition	3	Chem. 12—Gen. Chem	3
Humanistic—Social Studies	3	M. E. 1—Engr. Drawing	3
P. E. 1—Physical Educ	1	Engr. 4—Computer Prog	1
		P. E. 2—Physical Educ	1

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math. 201—Analytic Geo. & Calculus III	5	Math. 301—Diff. Equations	3
Phys. 24—Gen. Physics	5	Chem. 231—Phys. Chem	3
Chem. 27—Qual. Analysis	2	Ch. E. 170—Chem. Proc. Meas	3
Ch.E. 225—Chem. Proc. Calcns. I	3	Ch. E. 226—Chem. Proc. Calcns. II	3
Speech 175—Public Speaking	3	Engl. 60—Exposition	3
P. E. 5—Physical Educ	1	Humanistic—Social Studies	3
		P. E. 6—Physical Educ	1

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
Chem. 233—Phys. Chem	3	Ch.E. 243—Ch.E. Lab. I	2
Ch.E. 204—Ch.E. Matls	2	Ch.E. 235—Prin. Ch.E. II	3
Ch.E. 234—Prin. Ch.E. I	3	Ch.E. 262—Ch.E. Thermo II	3
Ch.E. 261—Ch.E. Thermo. I	3	C. E. 101—Mech. Mtls	3
M. E. 90—Analytic Mechs.	4	C. E. 102—Mech. Mtls. Lab	1
Humanistic—Social Studies	3	Humanistic—Social Studies	6

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
Chem. 210—Org. Chem	3	Chem. 212—Org. Chem	3
Ch.E. 244—Ch.E. Lab. II	2	Ch.E. 386—Ch.E. Design II	3
Ch.E. 385—Ch.E. Design I	3	E. E. 121—Fund. E. Mech. Lect	2
E. E. 119—Fund. E. Cir. Lect	2	E. E. 122—Fund. E. Mach. Lab	1
E. E. 120—Fund. E. Cir. Lab	1	Technical Elective	4
Technical Elective	3	Humanistic—Social Studies	3
Humanistic—Social Studies	3		

CURRICULUM IN CIVIL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Engl. 1—Composition	3	Humanistic—Social Studies	3
Engr. 4—Intro. to Computer Prog.	1	M. E. 10—Descriptive Geom	3
Math. 80—Analytic Geom. & Calculus I	5	Math. 175—Analytic Geom & Calculus II	5
M. E. 1—Engr. Drawing	3	Phys. 23—Gen. Physics	5
Chem. 11—Gen. Chemistry	5	P. E. 2—Physical Educ	1
P. E. 1—Phys. Ed	1		

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Phys. 24—Gen. Physics	5	Chem. 12—Gen. Chemistry	3
C. E. 50—Statistics	3	C. E. 101—Mech. of Materials	3
C. E. 111—Engineering Measurements and Surveys	4	C. E. 102—Mech. of Materials Lab	1
Math 201—Analytic Geom. & Calculus III	5	C. E. 156—Dynamics	3
P. E. 5—Physical Educ	1	C. E. 182—Engr. Materials	2
		Math. 301—Diff. Equations	3
		Humanistic—Social Studies	3
		P. E. 6—Physical Education	1

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
C. E. 221—Structural Analysis	4	Speech 175—Public Speaking	3
C. E. 212—Transportation Systems Engr	3	C. E. 222—Reinforced Concrete	3
C. E. 240—Fluid Mechanics	3	C. E. 291—Sanitary Engineering	4
C. E. 241—Fluid Mechanics Lab	1	C. E. 340—Applied Fluid Mechanics	2
Engl. 60—Exposition	3	M. E. 302—Engr. Thermodynamics	3
or		Humanistic—Social Studies	3
Engl. 61—Technical Writing			
Humanistic—Social Studies	3		

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
C. E. 223—Steel Structures	3	E. E. 119—Fund. of Elect. Cir	2
C. E. 341—Hydrology	2	E. E. 120—Fund. of Elect. Cir. Lab	1
C. E. 355—Soil Mechanics	3	C. E. 374—Civil Engr. Systems Design ...	3
C. E. Open Chansels	3	C. E. Technical Elective	3
C. E. 348—Environmental Sanitation	3	Elective	3
C. E. 367—Construction Contracting	3	Humanistic—Social Studies	6
C. E. 372—Foundations	3		
C. E. 375—Statically Indeterminate Structures	3		
C. E. 396—Highway Engineering	3		
Humanistic—Social Studies	3		

CURRICULUM IN ELECTRICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 80—Analytic Geom. & Calculus I	5	Math. 175—Analytic Geom. & Calculus II	5
Chem. 11—General Chemistry	5	M. E. 1—Engr. Drawing	3
Engl. 1—Composition	3	Engr. 4—Intro. to Computer Prog.	1
Humanistic—Social Studies	3	Phys. 23—General Physics	5
P. E. 1—Physical Education	1	Humanistic—Social Studies	3
		P. E. 1—Physical Education	1

<i>Third Semester</i>	<i>Hours</i>	<i>Fourth Semester</i>	<i>Hours</i>
Math 201—Analytic Geom. & Calculus III	5	Math. 301—Diff. Equations	3
Phys. 24—General Physics	5	M. E. 90—Analytical Mechanics	4
E. E. 163—Circuit Theory I	4	E. E. 164—Circuit Theory II	4
Humanistic—Social Studies	3	Chem. 12—General Chemistry	3
P. E. 5—Physical Education	1	Engl. 60—Exposition	3
		P. E. 6—Physical Education	1

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
E. E. 215—Transients in Lumped Networks	4	E. E. 276—Distrib. Trans. Netw.	4
E. E. 225—Electromag. Fields	3	E. E. 286—Electr. Cir. & Sign. I	4
E. E. 235—Electr. & Electr. Devices	4	E. E. 296—Electromech. Conver. I	4
E. E. 245—Interlinked Elect. & Mag. Cir ..	3	C. E. 101—Mechanics of Mat	3
Humanistic—Social Studies	3	M. E. 302—Applied Thermo	3

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
E. E. 307—Fund. of Control Sys	3	C. E. 240—Fluid Mechanics	3
E. E. 337—Electronic Circ. & Signals II ...	3	Humanistic—Social Studies	6
E. E. 347—Electromech. Conver. II	3	Elective	6
Phys. 360—Modern Physics	3	Speech 175—Public Speaking	3
M. E. 303—Applied Thermo	3		
Humanistic—Social Studies	3		

CURRICULUM IN INDUSTRIAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 80—Analytic Geom. & Calculus I	5	Math. 175—Analytic Geom. & Calculus II	5
Chem. 11—Gen. Chem	5	Chem. 12—Gen. Chem	3
Engl. 1—Composition	3	Humanistic—Social Studies	9
M. E. 1—Engr. Drawing	3	P. E. 2—Phys. Ed	1
Engr. 4—Intro. Computer Prog	1		
P. E. 1—Phys. Ed	1		
<i>Third Semester</i>			
Math 201—Analytic Geom. and Calculus III	5	<i>Fourth Semester</i>	<i>Hours</i>
Phys. 23—Gen. Physics	5	Engl. 60—Exposition	3
I. E. 180—Production Methods	3	Phys. 24—Gen. Physics	5
Humanistic—Social Studies	3	I. E. 205—Ind. Engr	3
P. E. 5—Phys. Education	1	M. E. 90—Analytic Mech.	4
		Speech 175—Public Speaking	3
		P. E. 6—Phys. Education	1
<i>Fifth Semester</i>			
Statistics (Math.) 320—Math. Statistics	3	<i>Sixth Semester</i>	<i>Hours</i>
I. E. 206—Ind. Engr. Lab	3	E. E. 121—Funds. of Elec. Mach. Lect	2
I. E. 280—Prod. Control	3	E. E. 122—Funds. of Elec. Mach Lab	1
C. E. 101—Mech. of Mat. Lect	3	I. E. 339—Eval. of Engr. Data	3
E. E. 119—Funds. of Elec. Cir. Lect	2	C. E. 240—Fluid Mechanics	3
E. E. 120—Funds. of Elect. Cir. Lab	1	I. E. 295—Engr. Personnel Pract	2
M. E. 302—Applied Thermo	3	M. E. 211—Sci. of Engr. Mat. I	2
		M. E. 212—Sci. of Engr. Mat. Lab. I	1
		Humanistic—Social Studies	3
<i>Seventh Semester</i>			
I.E. 387—Operations Analysis I	3	<i>Eighth Semester</i>	<i>Hours</i>
I. E. 349—Engr. Qual. Control	3	I. E. 397—Operations Analysis II	3
Acctg. 304—Administrative Accounting	3	I. E. 38—Factory Layout	3
Humanistic—Social Studies	3	I. E. 388—Computer Systems	3
Technical Elective	2	Technical Elective	6
I. E. 358—Econ. Studies in Engr.	3	Humanistic—Social Studies	3

CURRICULUM IN MECHANICAL ENGINEERING

<i>First Semester</i>	<i>Hours</i>	<i>Second Semester</i>	<i>Hours</i>
Math. 80—Analytic Geom. & Calculus I	5	Math. 175—Analytic Geom. & Calculus II	5
M.E. 11—Engineering Drawing	3	M.E. 103—Descriptive Geometry	3
Chem. 11—General Chemistry	5	Chem. 12—General Chemistry	3
Humanistic—Social Studies	3	Engl. 1—Composition	3
P.E. 1—Physical Education	1	Humanistic—Social Studies	3
		P.E. 2—Physical Education	1
<i>Third Semester</i>			
Math. 201—Analytic Geom. & Calculus III	5	<i>Fourth Semester</i>	<i>Hours</i>
M.E. 80—Machine Tool Lecture	1	Math. 301—Differential Equations	3
M.E. 81—Machine Tool Laboratory	2	M.E. 99—Engr. Thermodynamics I	3
Phys. 23—General Physics	5	Phys. 24—General Physics	5
Humanistic—Social Studies	6	M.E. 90—Analytical Mechanics	4
P.E. 5—Physical Education	1	Humanistic—Social Studies	3
		P.E. 6—Physical Education	1

<i>Fifth Semester</i>	<i>Hours</i>	<i>Sixth Semester</i>	<i>Hours</i>
Engr. 304—Dig. Comp. Appl. in Engr.	3	M.E. 211—Sci. of Engr. Materials I	2
M.E. 199—Engr. Thermodynamics II	3	M.E. 212—Sci. of Engr. Mat. Lab. I	1
E.E. 119—Fund. of Elect. Cir. (lect.)	2	M.E. 230—Thermodynamics of Gas Flow ...	3
E.E. 120—Fund. of Elect. Cir. (lab.)	1	M.E. 241—Mechanical Laboratory I	2
M.E. 205—Kinematic & Kinetic Analysis ...	3	M.E. 215—Advanced Dynamics	3
C.E. 101—Mechanics of Materials	3	C.E. 240—Fluid Mechanics	3
Engr. 60—Exposition	3	E.E. 121—Fund. of Elect. Mach. (lect.) and	
		E.E. 122—Fund. of Electr. Mach. (lab.) ...	3

<i>Seventh Semester</i>	<i>Hours</i>	<i>Eighth Semester</i>	<i>Hours</i>
M.E. 311—Sci. of Engr. Mat. II	2	M.E. 243—Mechanical Laboratory III	2
M.E. 312—Sci. of Engr. Mat. Lab. II	1	M.E. 221—Machine Design	3
M.E. 330—Heat Transfer	3	Free Elective	2
M.E. 242—Mechanical Laboratory II	2	Humanistic—Social Studies	3
M.E. 220—Machine Design	3	Technical Electives	6
Speech 175—Public Speaking	3		
Humanistic—Social Studies	3		

Comparing the 1966 curricula with that of 1950, it will be noted that calculus now begins in the freshman year, that Computer Programming has replaced Machine Tool Operations, and that Differential Equations is now a required course. In addition, most courses having the same titles as those in 1950 were, in reality, highly sophisticated in comparison.

In 1966, cooperative work-study programs were offered by the Alton Box Board Co., the Century Electric Co., Deere & Co., Ford Motor Co., McDonnell Aircraft Corp., Missouri State Highway Department, Missouri Pacific Railroad Co., and the National Aeronautics and Space Administration. Such co-op students are usually selected at the end of the freshman year by representatives of companies involved. By working half-time and going to college half-time, they can earn money for continuing their education and, at the same time, gain valuable, practical engineering experience. Students taking advantage of these programs should complete work for their BS degree in five calendar years.

The BS degree at Columbia has had a long and distinguished history. Perhaps the best review is that written by Dean Harry Curtis in 1948 as an introduction to the Directory of Engineering Graduates 1878-1948:

Degrees in engineering have been regularly granted by the University of Missouri - Columbia only since 1878 when a School of Engineering was set up with Thomas Jefferson Lowry as its first dean. Long before this date, however, instruction in subjects peculiar to engineering was offered in the University. In 1849, only ten years after the founding of the University, a course in "Surveying, Levelling and Classical Topography" was offered. In 1856 a "chair of civil engineering" was established. Several men who received B.S. degrees in the Arts College in the period of 1856 to 1874 were later listed as following the engineering profession. The Annual Annoucement for the year 1869 lists a "Department of Civil and Military Engineering and Tactics" under Major General R. W. Johnson, U.S.A. The Catalogue Annoucement of 1875 lists a "Course in Engineering" with a curriculum consisting of two years of preparatory work and four years of college work. In the same catalogue, however, there is to be found a list of "departments still needed" and this includes a "Department of Engineering" as well as a "College of Mechanical Arts."

While a few engineering subjects were offered as early as 1849, and, except for the period of the Civil War, instruction of some sort was offered in engineering subjects from year to year, it was not until 1877-78, when the School of Engineering was finally launched under Dean Lowry, that education in engineering really got under way in the University at Columbia.

In the period 1893 to 1906 the administration of engineering instruction was officially under the College of Agriculture and Mechanic Arts, but in 1906 the School of Engineering again won independent status. In 1926 the name was changed to the College of Engineering.

A variety of degrees have been granted in engineering. In 1878 the newly appointed dean, Thomas Jefferson Lowry, was granted a C.E. (Hon.) degree and James Parker Bates and Jonathan Houston Davis were given a B.S. in C.E. degree. In the following year, 1879, the degree Topographic Engineer and Civil Engineer were given, and in 1881 the degree Surveyor was granted as well as the B.S. in Civil Engineering, and the degrees Topographic Engineer and Civil Engineer. In 1884 the degree B.S. in Engineering was awarded. In 1889 a B.S. in Electrical Engineering was granted, although at that time no Electrical Engineering Department had been organized. The degree Electrical Engineer was first granted in 1891. The uniform practice of granting the B.S. degree with designation appears to have been adopted in 1894. The first B.S. in Mechanical Engineering appears in 1897, and in Chemical Engineering in 1905. The professional degrees, C.E., E.E., M.E., etc. were also granted from time to time.

Beginning with the Commencement in June 1916, the degree with designation was dropped and the degree was simply B.S. in Engineering, although the professional degrees C.E., E.E., etc. were continued until 1934 when the M.S. degree with designation was granted in the Graduate School. In 1936 the College of Engineering returned to the plan of granting the B.S. degree with designation and this practice has continued to date.

The BS degree in agricultural engineering was fully accredited by ECPD in 1952 and the BS in industrial engineering was fully accredited by ECPD in 1962, so by 1966 all undergraduate degrees offered by the College (AgE, CE, ChE, EE, IE, and ME) were fully accredited.

In the fall of 1966, MS degree programs were offered in agricultural engineering, chemical engineering, civil engineering, electrical engineering, industrial engineering, mechanical engineering, nuclear engineering, engineering sciences, and sanitary engineering.

Admission to the graduate school required graduation with acceptable grades from an accredited college, plus acceptance by the department concerned, if the student were working toward a degree. The MS degree required a minimum of 30 semester hours of course work, with 15 of those in courses numbered 400 or above.

The PhD degree was offered in agricultural engineering, chemical engineering, civil engineering, electrical engineering, mechanical engineering, nuclear engineering (authorized in 1966) and sanitary engineering. The PhD required at least six semesters of study after receiving the BS, selection of a research problem, passing an examination in two languages (German, French, Russian, or Spanish), and passing preliminary and final examinations.

In 1966, the courses available for both seniors and graduate students numbered from 300 to 399 were:

In agricultural engineering: Problems, Farm Building Design, Digital Computer Applications, Farm Electrification, Crop Processing, Irrigation and Drainage, and Farm Power and Machinery. The courses for graduate students only numbered 400 and above were: Problems, Advanced Topics, Farm Buildings, Seminar, Research Methods and Instrumentation, Processing, Water Management, Similitude in Engineering, Mechanical Equipment, and Research.

In chemical engineering, the courses in the 300 group were: Problems, Topics, Digital Computer Applications, Economics, Transport Phenomena, Nuclear Engineering, Chemical Kinetics, Instrumentation, Design, Nuclear Energy, and Radioisotope Techniques. The courses in the 400 group were: Problems, Seminar, Heat Transfer and Fluid Flow, Distillation and Rectification, Absorption and Extraction, Research, Thermodynamics, Process and Plant Design, Mathematical Studies of Operation and Research.

In civil engineering, the courses in the 300 group were: Problems, Topics, Digital Computer Applications, Advanced Surveying, Prestressed Concrete, Plain Concrete, Applied Fluid Mechanics, Hydrology, Hydraulics of Open Channels, Hydraulic Machinery, Flood Control, Fluid Mechanics, Environmental Sanitation, Experimental Stress Analysis, Mechanics of Materials, Soil Mechanics, Administration, Construction and Contracting, Public Construction, Foundations, Design, Statically Indeterminate Structures, Plastic Analysis and Design, Transportation Engineering, Sanitary Engineering, Sanitary Engineering Chemistry, Highway and Traffic Engineering, and Sanitary Engineering Chemistry Laboratory. The courses in the 400 group were: Problems, Topics, Theory of Elasticity, Plates and Shells, Elastic Stability, Plasticity, Numerical Methods, Seminar, Structural Theory and Design, Structural Systems, Reinforced Concrete, Concrete Shells, Methods of Investigation, Soil Mechanics, Highway Transportation, Fluid Mechanics, Hydraulic Engineering Hydromechanics, Water Quality, Public Health Engineering, Research, Construction Practices, Administration, Reinforced Concrete Members, Reinforced Concrete Structures, Research, Unit Process Laboratory, Sanitary Engineering Operations, Sanitary Engineering Processes, Water Treatment Facilities, and Industrial Water Treatment.

In electrical engineering, the 300 group courses were: Problems, Topics, Digital Computer Applications, Control Systems, Circuit Theory, Electronic Circuits, Amplifier Design, Electromechanical Conversion, Feedback Systems, Induction Machinery, Power System Circuits, Power Transmission, Illumination, Microwave Principles, Acoustical Engineering, Electronic Computer and Switching Circuits, and A. C. Machines. The courses in the 400 group were: Problems, Topics, Seminar, Electrical Machine Theory, Tensor Analysis of Circuits, Power System Stability, Solid State Energy Conversion, Power System Relaying, Computer Organization and Logical Design, Electron Tubes, Conduction in Gases and Superconductors, Magnetogas dynamics, Quantum Electronics, Research, Static Electromagnetic Fields, Circuit Analysis, Communication Theory, Information and Coding Theory, High Frequency Transmission and Radiation, Antennas, and Research.

In industrial engineering, the 300 group of courses were: Problems, Industrial Safety, Digital Computer Applications, Reliability, Evaluation of Data, Experimental Design, Quality Control, Economic Studies, Factory Layout, Tool Design, Operation Analysis, and Computer Systems. The 400 group of courses

were: Problems, Topics, Methods Analysis, Design for Production, Management as an Engineering Function, Scientific Management, Design for Production and Maintenance Queues, Quality Analysis, Research Economic Studies, Programming, and Research.

In mechanical engineering, the courses in the 300 group were: Problems, Topics, Applied Thermodynamics, Digital Computer Applications, Engineering Materials, Micrology, Machine Design, Aircraft Stress Analysis, Kinetics, Heat Transfer, Gas Dynamics, Heating and Air Conditioning, Instrumentation, Nuclear Engineering, Steam Power Plants, Steam and Gas Turbines, Automatic Control, Internal Combustion Engines, Aerospace Propulsion, Automotive Engineering, Machinery for Compressible Fluids, Refrigeration, and Aerodynamics. The courses in the 400 group were: Problems, Topics, Powder Metallurgy, Minerals at Elevated Temperatures, Seminar, Nuclear Reactor Theory, Aerodynamics, Vibrations, Dynamics, Nonlinear Analysis, Dynamical Theory, Space Mechanics, Dynamics of Machines, Vibration of Distributed Parameter Systems, Boundary Layer Theory, Gas Dynamics, Thermodynamics, Conduction Heat Transfer, Instrumentation, Research, Combustion, Heat Exchanges, Refrigeration, Machine Tool Processes, and Research.

In nuclear engineering, the 300 courses were: Nuclear Engineering, Introduction to Nuclear Theory, and Radioisotope Techniques. The courses in the 400 group were: Topics, Nuclear Radiation Laboratory, Seminar, Nuclear Reactor Theory, the Atomic Nucleus Interaction of Radiation and Matter, Reactor Engineering, Nuclear Materials, and Research.

A summary of the number of graduate courses offered in 1940, 1950 and 1966 is given on page II-31a. While the number of courses offered remained approximately the same in 1940 and 1950, this number doubled in the 1950-1966 interval. There was also a great increase in scientific and mathematical sophistication in courses of identical names in the 1940 and 1966 curricula during this period, due to the scientific advances during World War II and to the higher level of scientific and mathematical training of the faculty.

Prior to the awarding of the MS degree in engineering, the College awarded professional degrees such as Electrical Engineer, Mechanical Engineer, etc., for successfully completing one year of course work after the BS degree. The student was enrolled in the College of Engineering but not registered in the Graduate College. The Graduate School Bulletin of Degrees Conferred indicates the first professional degree was that of Civil Engineer, awarded to H. H. Lotter in 1900. The practice of giving professional degrees was discontinued in 1934, when the MS degree with engineering designation was introduced, with the student registered in graduate school. Enrollment in the graduate school is shown in the graph on page 54.

The first MS degrees awarded were as follows: Agricultural Engineering in 1925 to G. W. Giles; Chemical Engineering in 1934 to C. R. Clark; Civil Engineering in 1934 to F. N. Beighley; Electrical Engineering in 1934 to J. S. Johnson; Management Engineering in 1935 to D. A. Marrey; Mechanical Engineering in 1940 to R. E. Baugh; Industrial Engineering in 1959 to James Schloemann, Richard Jauregul, and Joe Patterson; and Nuclear Engineering in 1964 to Willard Bacon.

Summary of Number of Senior and Graduate Courses Offered for Three Different Years

	1940	1950	1966
Courses Numbered 100 and above for Seniors and Graduate Students	7	5	7
Courses Numbered 200 and above for Graduate Students Only	6	8	12
Courses Numbered 300 and above for Seniors and Graduate Students	20	17	30
Courses Numbered 400 and above for Graduates Only	8	8	17
Courses Numbered 300 and above for Seniors and Graduate Students	17	17	13
Courses Numbered 400 and above for Graduates Only	5	13	25
	43	62	108
	58	55	133
TOTAL	58	55	133

It may be of particular interest to note the years of initial accrediting of the BS curricula offered by the College of Engineering and the other educational institutions in the state (note that the Engineer's Council for Professional Development began the accrediting procedure during the 1936-38 period)

DATES OF FIRST ECPD ACCREDITING
FOR VARIOUS CURRICULA (33rd ANNUAL REPORT ECPD)

Curricula	Columbia	Rolla	St. Louis U.	Washington U.
Ag. Engr.	1952			
Ch. Engr.	1940	1951		1948
Civil Engr.	1936-38	1936-38	1962	1936-38
Elect Engr.	1936-38	1936-38	1951	1936-38
Indus. Engr.	1962			
Mech. Engr.	1936-38	1950		1936-38

Interesting historical information is found in the awarding date and names of first recipients of the graduate level degrees:

Professional Degrees (awarded for 1 year of residence study after the BS degree)

1900—H. H. Lotter, Civil Engineer
C. W. Hogan, Electrical Engineer

Master of Science Degree

1925—G. W. Giles, Agricultural Engineering
1934—C. R. Clark, Chemical Engineering
F. N. Beighley, Civil Engineering
J. S. Johnson, Electrical Engineering
1935—D. A. Harvey, Management Engineering
1940—R. E. Bauch, Mechanical Engineering
1959—J. L. Patterson, Industrial Engineering
1964—W. Bacon, Nuclear Engineering

Doctor of Philosophy Degree

1942—R. J. W. Koopman, Electrical Engineering
1944—F. D. Oldham, Chemical Engineering
1949—G. K. Gillan, Civil Engineering
1957—C. N. Hinkle, Agricultural Engineering
1964—T. W. Myers, Mechanical Engineering

III. THE STUDENTS

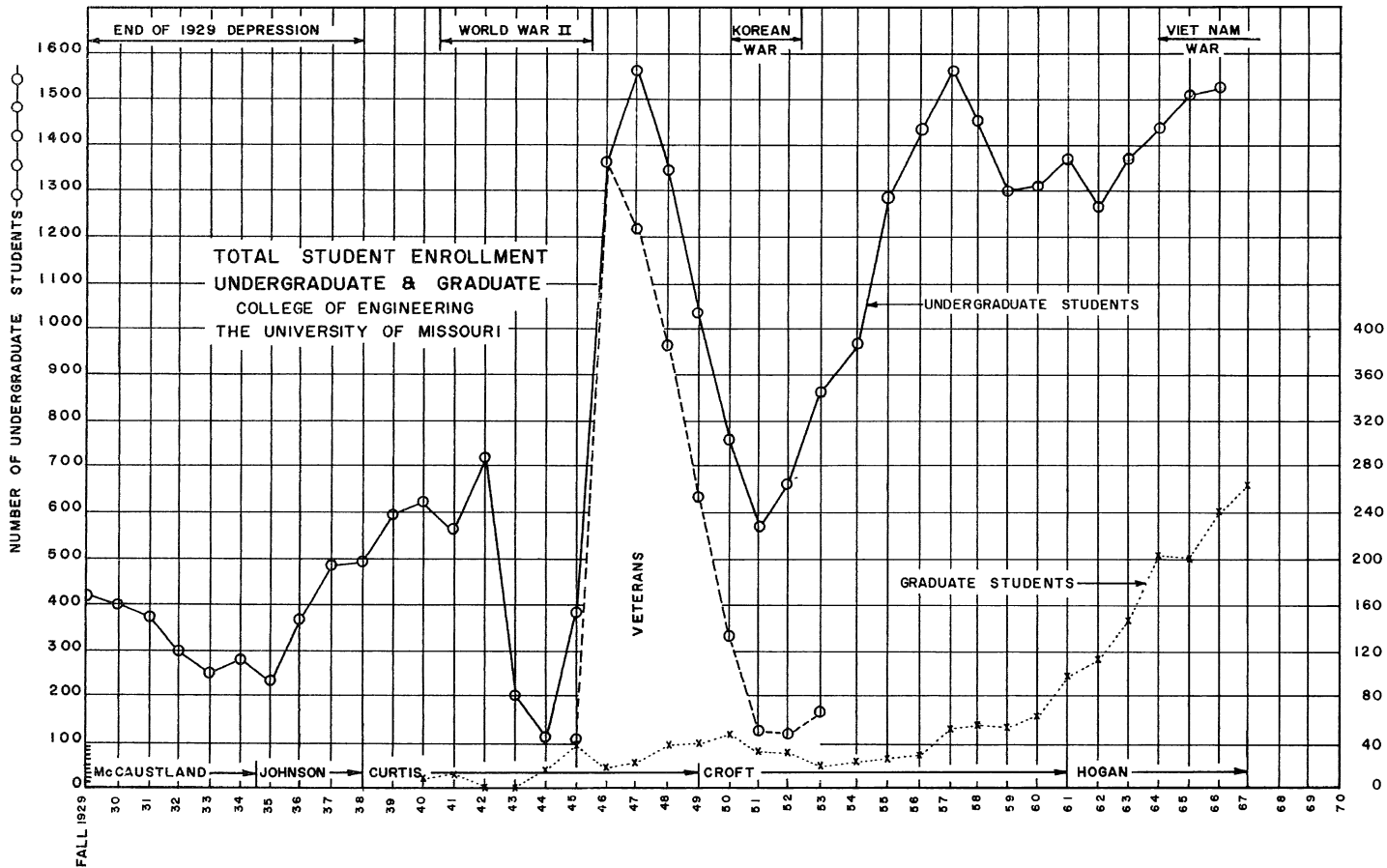
The beginnings of most lasting contributions to the American educational scene were extremely modest, and so it was for engineering education at the University. William Barr and Thomas Field, both of Boone County, were listed in the University Catalog at this early time as "Civil Engineering Graduates of 1856." Specialized engineering fare at that time was extremely meager. For example, the first mention of engineering was the inclusion of a course "Civil Engineering and the Use of Instruments" in the University Catalog of 1849. This course was introduced in the four-year curriculum of that day which also included Latin, Greek, English, mathematics through calculus, chemistry, physics, surveying and leveling. So Barr and Field were the first two engineering students.

This apparent engineering student enrollment of two has increased with the passing of many years to that shown in the graph on page 54. The undergraduate enrollment was 618 in 1940, 857 in 1950, and 1530 in 1966, while the graduate student enrollment was 10 in 1940, 49 in 1950 and 242 in 1966. The unusually large increase in the enrollment of graduate students was due, in part, to the many advances made in engineering sciences during and since World War II which could not be included in a four-year curricula. Senior students were urged to become knowledgeable in these advances and many scholarships and fellowships were made available by such federal agencies as the National Science Foundation, the National Institute of Health, the National Aeronautics and Space Administration, and the Atomic Energy Commission. Part-time employment as graduate research assistants on projects conducted by the faculty were also supported financially by those same federal agencies.

Traditionally, the student body of the College has been heterogeneous with respect to home backgrounds with about half coming from the population centers of St. Louis, Kansas City, Springfield, and St. Joseph, and the other half coming from smaller communities and surrounding farms. This provides an unusually desirable melting pot for those with exclusively rural or urban experiences. Typically, the engineering student is intellectually curious, honest, well-balanced, hard-working, and receives top percentile scores on placement tests given to all students entering the University.

It is evident, from inspecting the graph on the College's enrollment, that there were rapid fluctuations between the number of engineering students during World War II and the number during the returned normal conditions. For example, in September 1942, there was a civilian enrollment of 721 in engineering, but in the spring of 1944 civilian enrollment had dropped to 64. The total enrollment of the entire University was about 5,000 for the spring semester of 1946, and one year later it had increased to 11,000—and, during this same period, the engineering enrollment increased from 603 to 1,546. This resulted in overcrowded classrooms, with many classes conducted at night. Later, the low birth rate during World War II was to cause a drop in enrollment during the 1960-62 period.

Immediately following the war, the character of the student body changed considerably. In 1948, there were 1,141 veterans in a total engineering enrollment of 1,554. These men, many of whom were married, were mature in their thinking and anxious to complete the work for the BS degree and begin their civilian employment as engineers.



NUMBER OF GRADUATE STUDENTS ...

The undeclared war in Korea June 1950 to July 1953, resulted in another group of mature veterans as engineering students. For example, the 1953 enrollment included 110 veterans, three women, and 20 foreign students from 15 different countries in a total enrollment of 680. The peak enrollment of veterans occurred in 1957, when the composition of the College of Engineering enrollment was 549 veterans, 13 women, and 74 foreign students from 26 foreign countries in a total enrollment of 1,558. About 15% of the student body were married. In 1966 about 22% of the engineering student body were married, there were 11 women students, and 157 students from 23 foreign countries. In 1963, the Air Force sent 13 officers to obtain their degrees in electrical engineering.

As one might expect, the number and types of degrees awarded to engineering students have varied with the increasing demand for graduate study over the years. For example, returning World War II veterans were largely responsible for the greatest number of BS degrees in 1950, when 344 BS degrees and only 19 MS degrees were awarded. By 1965, the growing importance of the MS was indicated when only 239 BS degrees were awarded while the number of MS degrees increased to 106, and 10 PhDs also were earned. The greatest number of PhDs earned, 11, was in 1967, a year which also saw 232 BS degrees and 104 MS degrees awarded. The increase in graduate student enrollment is shown in the graph on page 54.

The extracurricular activities of engineering students have been greatly enriched by the tradition of declaring the week during which St. Patrick's Day occurs as "Engineers Week," a custom which has spread to many engineering colleges across the country. It was on a warm spring day in March, 1903—perhaps as the result of a severe case of spring fever—that the students decided an unbearably long period stretched between officially authorized holidays. They therefore declared their own holiday on St. Patrick's Day, March 17. It was on this day that the whimsical "discovery" was made (or perhaps it should be called a useful invention) that Erin Go Bragh ("Ireland Forever"), somewhat loosely translated, meant "St. Patrick was an Engineer." Thenceforth, the good saint became the patron saint of all engineers. To corroborate St. Pat's engineerhood, he was later credited in song with inventing the "switch" (to "switch" the snakes out of Ireland), the "worm drive," and the "calculus" for engineers to cuss.

The first St. Pat's celebration was loosely organized, to say the least. Later, the Engineers' Club (organized in 1893 and incorporated in 1934), began to organize the celebration in earnest. The 1905 celebration included the appearance of the saint as impersonated by an engineering student who ruled over the entire celebration. The discovery of the Blarney Stone in the excavation for an addition to the Engineering Building was made in 1905. Apparently, the first Blarney Stone of 1905 was a figment of the imagination as it appears to have been only a sketch on paper with suitable hieroglyphs. But the following year, early in 1906, some seniors decided that the Blarney Stone should actually be a real physical object for the sake of real historical authenticity and therefore proceeded to mold one in concrete complete with indented symbolic characters as appeared in the 1905 sketch. Also in 1906, an annual publication called *The Shamrock* appeared, and in 1931 the first issue of a mimeographed publication, *The Engineer's Monthly Bulletin*, was published. *The Engineer's Monthly Bulletin* eventually be-

came a yearbook, and in 1933 became *The Shamrock*, which was published four times a year in 1940, seven times a year in 1942, and eight times a year in 1950, which publication frequency has continued to this day.

In 1906, St. Pat "knighted" all seniors who knelt and kissed the Blarney Stone. A. Ross Hill, president of the University and Arthur Green, dean of engineering, were exalted as "Honorary Knights of St. Pat." An engineering open house with laboratory exhibits open to the public and a parade complete with a five-piece band were also provided. The whereabouts of the Blarney Stone between yearly appearances and the identity of the person portraying St. Pat are both mysterious secrets, but it is possible that alumni who are members of the Steinmetz Club may have some knowledge of these mysteries. In any event, each March telegrams to the Engineers' Club are received from all over the world from St. Pat promising to be present with the ancient stone at the proper time and place, for knighting more of his loyal followers during Engineers' Week.



St. Pat Returns Again

The activities of Engineers' Week became more numerous with the passing of the years. Thus, the organized events for the spring of 1941 included: a Burrall Sunday service in the Stephens College Chapel, the selection of a "Queen of Love and Beauty," a beard-growing contest, a Midnight Movie show, a hamburger show, serenading of girls' dormitories, a dedication of the "Campus Stunt," a parade with some 10 floats and three bands, laboratory exhibits, a banquet, the Engineers' Ball, the Knighting Ceremony, and registration of alumni. The tentative program is given in greater detail from the *Shamrock* as follows:

PROGRAM FOR ENGINEERS WEEK

March 20-22, 1941

THURSDAY, MARCH 20

- 7:00 p.m.—Opening of Laboratories for Engineers' Exhibition.
- 10:00 p.m.—Barbecue and judging of Beard Contest following by Serenade of Sororities, Girls' Dormitories, Stephens College, and Christian College.

FRIDAY, MARCH 21

- 11:00 a.m.—Dedication of Campus Stunt.
- 12:00 noon—Honorary Fraternities Luncheon.
- 1:00 p.m.—Registration of Alumni—continuing through Saturday.
- 1:00 p.m.—Picture Show for Engineers at Uptown Theatre—Free.
- 4:30 p.m.—Arrival of St. Patrick, Parade to the Engineering Building, and Welcome to the Campus by the Dean.
- 7:00 p.m.—Appearance of Blarney Stone and Conferring of Knighthood by St. Patrick.
- 7:30 p.m.—Continuation of Engineers Exhibition in the Laboratories.
- 9:00 p.m. to 1:00 a.m.—All-School Frolic in Rothwell Gymnasium (Informal).

SATURDAY, MARCH 22

- 8:00 a.m. to 10:00 a.m.—Engineering Building open to the Public, Tickets and Programs for the events of the day available in the hallway of the Engineering Building, Registration of Alumni, St. Pat's Buttons available.
- 10:00 a.m.—Engineering Assembly.
- 12:00 noon—Bridge Luncheon for Wives of Alumni and Faculty.
- 12:00 noon—Faculty-Alumni-Student Luncheon.
- 1:30 p.m. to 3:30 p.m.—Annual Meeting of the Alumni Association and the Engineering Foundation. Election of officers. These meetings will follow one another at the luncheon table.
- 3:00 p.m. to 4:45 p.m.—Laboratory exhibitions.
- 6:00 p.m.—Alumni Association Banquet—Faculty-Alumni-Wives Seniors and Guests. Formal or Informal. Presentation of Engineering Foundation Awards.
- 9:00 p.m. to 12:00 Midnight—ST. PAT'S BALL in Rothwell Gymnasium, Coronation of the Queen by St. Patrick, distribution of the special edition of the MISSOURI SHAMROCK. Formal.

Ten years later, in 1951, the Program for Engineers' Week was as follows:

PROGRAM FOR ENGINEERS WEEK
1951

SUNDAY

10:30 a.m.—Burrall Class, Stephens College.

TUESDAY

Midnight Show, Uptown Theatre

WEDNESDAY

Hamburg Show followed by Serenade at Christian and Stephens Colleges and women's dormitories at University.

THURSDAY

Working on campus Stunt (replica of V-2 rocket) and laboratory exhibits.

FRIDAY

Registration of Alumni in Dean's Office.

4:00 a.m.—St. Pat's Parade.

5:50 p.m.—Blarney Stone appears and Knighting Ceremony started. Laboratory Exhibits opened to public.

SATURDAY

Registration of Alumni in Dean's Office.

10:00 a.m.—Engineering Convocation in Jesse Auditorium where honors were given to students and the first "Missouri Honor Award for Distinguished Service in Engineering" were made to prominent engineers by Dean Huber O. Croft.

12:00 noon—Luncheon for students, alumni and faculty.

4:00 p.m.—Green Tea in Engineering Library. Laboratory Exhibits open to public.

9:00 p.m.—St. Pat's Ball and presentation of "Queen of Love and Beauty."

Membership in the Engineers' Club and interest in its activities decreased considerably in the post World War II period. During this period, many of the students were veterans, older, many of whom were married and starting families. These men were not interested in many club activities. Each department had its own student branch of a national society, and its own chapter of professional fraternity. Each of these organizations demanded student time for their special activities, lessening the time available for the Engineers' Club.

The continually increasing number of student automobiles and much-improved highways also diverted the student's attention and time from the demands of the Engineers' Club, for now the student had a convenient method of going home or other attractive places for the weekend. (In 1955, the total enrollment of the University was 8,800 with 5,200 cars registered by the University, or a ratio of 0.59 cars per student; two years later this ratio had dropped to 0.47; and in 1967, the ratio was 0.43, or a total of 8,600 cars for the total enrollment of 20,100.) Students on scholastic probation, freshmen under 21 years of age, and sophomores with a grade point less than 2.75 were not permitted to have cars.

While student cars were supposed to be registered with the University, many of them were not, so the number of student cars was even greater than indicated here.

During these years of contracting membership in the Club, the traditional parade which had been one of the most impressive events of St. Pat's week, had to be discontinued because of the lack of interest in building floats which embellished the parade. Therefore, in the spring of 1959, the parade was replaced by a gasoline economy run. In this contest, cars in several different weight and horsepower categories were carefully checked as to their gasoline consumption over a prescribed course.

Other changes in the program were to make the Green Tea more attractive. This important function, beginning in 1919, was given for the queen candidates by the students, assisted by faculty wives and student wives. It had been held in the Engineering Library where no kitchen facilities were available. Due to the generosity of President and Mrs. Elmer Ellis the president's home was made available for the Green Tea and reception, thus providing a more attractive background.

Prior to completion of the Jesse Auditorium in 1954, no room in the University was large enough to seat the College's student body. The new Jesse Hall Auditorium had a seating capacity of about 2,000, making it possible to house the honors convocation, for the various student honor awards, and the honor awards for distinguished service, to outstanding practicing engineers.

The program for the spring of 1966 was quite extensive, as is shown by this copy from the *Shamrock*:

ENGINEERS WEEK, 1966

SATURDAY, MARCH 12

8:00 a.m. to 2 p.m. - Gas Economy Run

SUNDAY, MARCH 13

10:30 a.m. - Assemble in Front of Engineering Building

11:00 a.m. - Burrall Class in Stephens College Chapel

MONDAY, MARCH 14

7:30 p.m. - Queen Skits and Interviews

11:00 p.m. - Midnight Show (Geology Auditorium)

TUESDAY, MARCH 15

7:30 p.m. - Slide Rule Contest

8:00 p.m. - Reception for Queen Candidates - Engineering Student's Wives
(Student Lounge, Electrical Engineering Bldg.)

WEDNESDAY, MARCH 16

5:15 p.m. - Annual Mid-Week St. Pat Food-Fest

THURSDAY, MARCH 17

7:00 p.m. - Assemble Laboratory Exhibits

FRIDAY, MARCH 18

ALL DAY - Alumni Registration, Dean's Office

12:40 p.m. - Judging of Beard-Growing Contest

2:00 p.m. - Engineering Convocation, Jesse Auditorium

Awarding Of Student Honors And Engineering Achievement Medals

3:00 P.M. - Knighting Ceremony, Engineering Building

6:00 P.M. - Alumni-Faculty Dinner Honoring Recipients of Honor Awards
(Student Union) - Ladies Invited - Informal

7:00 P.M. to 10:00 P.M. - Laboratory Exhibits and Open House

SATURDAY, MARCH 19

ALL DAY -Alumni Registration, Dean's Office

10:00 A.M. to 3:00 P.M. - Laboratory Exhibits and Open House

11:00 A.M. - Annual Alumni Business Meeting - Report on Engineering Foundation, Student Union, Rm. S-8

12:00 Noon - Alumni Luncheon (Student Union) - Ladies Invited

2:00 to 4:00 P.M. - Green Tea at President Ellis' Home

6:00 P.M. - Student-Faculty-Alumni Banquet (Student Union)

8:30 P.M. - St. Pat's Ball, Rothwell Gymnasium

10:15 P.M. - Coronation of Queen of Love and Beauty

As indicated previously, students learned much from the operations and activities of professional and honorary societies supported by each department of the College. The dates of each group's establishment on the Columbia campus were as follows:

1902 - Tau Beta Pi, Missouri Alpha Chapter (for highest ranking students of entire college)

1911 - Eta Kappa Nu (Electrical Engineering)

1925 - Pi Tau Sigma (Mechanical Engineering)

1934 - Chi Epsilon (Civil Engineering)

1959 - Alpha Epsilon (Agricultural Engineering. This was the first chapter of this fraternity as it was founded here.)

1963 - Alpha Pi Mu (Industrial Engineering)

The establishment dates of the student sections of the various national engineering societies were as follows:

1903 - American Institute of Electrical Engineers

1909 - American Society of Mechanical Engineers

1920 - American Society of Agricultural Engineers

1922 - American Society of Civil Engineers

1932 - American Institute of Chemical Engineers

1958 - American Institute of Industrial Engineers

Eligibility for membership in some of the professional fraternities depended on the student's grade point average. The grading systems used, expressed in letters together with the numerical equivalent and word description of the letter grade, were as follows: Excellent—E = A = 4.0; Superior—S = B = 3.0; Median—M = C = 2.0; Inferior—I = D = 1.0; Failure—F equals 0. Using the numerical equivalents of these grades, the senior class grades during the 1950-1960

period were distributed approximately as follows: lowest 20% of class, 2.0 to 2.14; next to lowest 20% of class, 2.14 to 2.28; the middle 20% of class, 2.28 to 2.48; the next to the highest 20% of the class, 2.48 to 2.78 and the highest 20% of the class, 2.78 to 4.0.

Placing seniors and graduate students in suitable positions after they receive their degrees has always been an important activity of engineering colleges. Dean Curtis, however, frowned upon this activity and actually discouraged representatives of companies in their efforts to visit Columbia for the purpose of interviewing graduating seniors.

This attitude changed in 1950, when Dean Croft appointed Robert Walker to teach industrial engineering courses in the Mechanical Engineering Department, and also to encourage companies to send representatives to Columbia to interview graduating students. George Elliott and Robert Eastman, who later became chairman of the Industrial Engineering Department, replaced Walker in this position. An added convenience to the interview procedures was the 1951 construction of the Engineering Annex on the west side of the Engineering Building. The Annex included four additional interview offices, adding to the three offices already used in the Engineering Building. At the present writing, ten offices are available for interviews. The greatest activity and improvement in placement policies came with the appointment of Jack Morgan in 1957 as Assistant to the Dean and Director of Placement for the College of Engineering.

Engineering Bachelor's Degrees Awarded--June 1967 Graduating Class
(Engineering Manpower Commission Report)

About 80% of the total awarded for entire year of 1967

Curriculum or Option	Schools with ECPD Accredited Curricula	Other Schools	All Schools Combined
Aerospace	1,096	193	1,289
Agricultural	221	21	242
Architectural	346	124	470
Ceramic	154	1	155
Chemical	2,394	52	2,446
Civil	3,885	250	4,135
Electrical-Electronic	7,600	583	8,183
Engineering, General	781	116	897
Eng. Sci., Phys., Mech.	722	100	822
Industrial, admin. -mgt.	1,687	319	2,006
Mechanical	5,497	721	6,218
Metallurgical-Materials	537	23	560
Min., Geol., Geophys.	220	5	225
Naval Arch. and Marine	39	343	382
Nuclear	106	39	145
Petroleum	92	8	100
All Other Engineering	400	123	523
Totals of Above	25,777 (1)	3,021 (2)	28,798

(1) Includes 687 estimated from 8 schools which did not respond

(2) Includes 322 estimated from 12 schools which did not respond

A manpower committee, made up of representatives of industry, engineering societies, and colleges initiated an accurate estimate of the number of BS and graduate engineers required each year in the United States. Since the beginning of this study, never has the supply of graduating engineers been as great as the demand. For example, in 1955 the number of graduates was estimated to be 25,000; in 1957 the estimates were supply—26,000, demand—35,000; and the maximum supply was reached in 1960 with 43,000 graduates for a demand of 60,000. For this same demand the supply then began to decrease and in 1962, the supply was only 32,000. A breakdown by departmental interests of the June 1967 graduates in the USA is given in the following tabulation.

The number of companies visiting the College to interview students for various years was as follows: 1949-35; 1951-80; 1956-193; 1958-331; 1961-205; 1966-297; and 1967-220.

The increase in starting salaries for engineers with BS degrees was caused partially by inflation but principally by the demand for these young men being greater than the supply. The median starting salary for various years was as follows: 1950-\$325; 1956-\$425; 1958-\$475; 1961-\$540; 1966-\$675; and in 1967-\$725. Engineers with their MS degrees were offered about \$50 more per month than those with the BS degree, while those with the PhD degree were offered from \$100 to \$200 per month more than those with the BS degree.

In 1955, some companies introduced another approach to insure the needed supply of young engineers by employing them at the end of the junior year. They also introduced co-op programs in which the student worked for the company part of the year, and enrolled in college for the remainder of the year. Some twenty companies had co-op programs with the College of Engineering in 1967.

The first positions of many graduating engineers are difficult to determine because many either enter the military service or leave Columbia before accepting a definite position. A sampling of the companies interviewing seniors indicated that in 1959 about half of the companies were from Missouri; in 1960 about 45% were from Missouri and in 1961, 42% were from Missouri.

In 1957, of those seniors reporting, 33% accepted positions in Missouri; in 1958, 70% of those reporting located in Missouri or bordering states; in 1959, this figure was 75%, and in 1960 it was 56%.

Interesting information as to the location of engineering graduates may be obtained from the four directories of engineering graduates. It should be realized, however, that these data are only samples of the graduates, as some addresses are incorrect and other graduates fail to return requested information. However, the first Directory of Alumni and Former Students (Bulletin No. 26 of the Engineering Experiment Station) compiled by J. R. Wharton in 1926, listed 1,250 names, with some 55% living in Missouri or the bordering states; the 1956 Directory compiled by Dean Huber Croft included some 3,224 names of which some 52% were in Missouri or bordering states; and the 1965 Directory compiled by Dean Joseph Hogan included some 7,037 names of which some 52% resided in Missouri or bordering states. The numbers of engineering alumni listed in the various states are given the following table:

Number of Alumni Residing in Missouri and Bordering States
as Indicated in the Engineering Alumni Directories
of 1926, 1948, 1956, and 1965

Year	Mo.	Ark.	Ill.	Iowa	Kan.	Okla.	Total	Total No. in Directory
1926	515	14	99	4	19	29	680	1250
1948	694	24	159	21	53	60	1011	2550
1956	1390	33	192	26	112	77	1830	3224
1965	2643	41	402	85	283	142	3596	7037

While the cost of attending the College of Engineering has increased considerably with the passing of the years, the number of financial aids and awards has increased at a faster rate, and there seems to be sufficient part-time work in Columbia so that no deserving high school graduate with the proper aptitude and attitude may be deprived of earning an engineering degree.

For example, every veteran of World War II, the Korean War, and the undeclared war of Viet Nam is eligible for educational grants sufficient for tuition, fees, books, and subsistence (for World War II, this amounted to \$105 per month for a single man and more if the man were married). Also available for worthy students are bank loans guaranteed by the U. S. government, which also pays the interest; loans under the National Defense Education Act; Curators Scholarships (since 1950) awarded to the top graduate in every high school in the State irrespective of the financial need of the student; and awards to the top 20% of each high-school class made on the basis of financial need. All of these aids annually relieve some 500 students of paying fees and tuition. Many corporations offer scholarships, such as Westinghouse, General Electric, Western Electric, Monsanto, Texaco, and Bendix. Others provide cash awards for outstanding students in various classes, such as the Weinlock Prize, the Missouri Society of Professional Engineers, the Norton Prize, Missouri Engineers of Chicago, Missouri Engineering Foundation, Skelly Oil Company, Black and Veatch, Minnesota Mining and Manufacturing, and American Society of Tool Engineers. Special grants also become available such as the three-year grant of \$56,000 to support four students completing their PhD work in the specialized field of "energy conversion." Thus, it is seen that an ambitious young man may find many avenues of approach to the solution of his financial problems in obtaining an engineering degree.

All students anticipate the time when they leave the campus and become alumni, and many alumni look forward to the time when they can return to the campus—maybe for a football game, maybe for a technical meeting of professional interest, or maybe for an alumni meeting where they discuss with classmates such important topics as: "What can we do for the old school," or "Do you remember the night when we . . .," or "Do you remember the day when old Prof. . . .?"

The proper vehicle for the latter discussions was, of course, an alumni organization. The Missouri Alumni held its first organizational meeting in 1852, four years before the start of the first regular passenger and mail service by horse-

drawn coach between Jefferson City and Columbia. The Engineering Alumni Association, in 1931, incorporated legally in the state as the "Missouri Engineering Foundation." It is probable that the Engineering Alumni Association was active prior to 1925.

The purpose of the Foundation was to raise money for supporting a loan fund for engineering students, scholarships for engineering students, and similar needs of the College of Engineering. To become a member of the Foundation, one had to donate, or pledge to donate, the sum of \$100. It was thought that the Foundation would prove a stimulus for a great many alumni to contribute. However, apparently no vigorous membership drives were undertaken and in 1964, the Foundation members numbered only 52, which would provide the Foundation with an average income of about \$155 per year.

Originally, the Engineering Foundation also gave prize money to outstanding students. In 1951 the Foundation financially supported the forming of dies and the striking of medals for the Missouri honor award for distinguished service in engineering. Recipients of the awards were selected by a committee of five alumni, and the awards were made by Dean Huber O. Croft at the convocation during St. Pat's Week.

The University reorganized the Alumni Association in the early 60's and, among other improvements, initiated a vigorous campaign for alumni donations. In view of this fact, the members of the Missouri Engineering Foundation, in March 1961, voted to have the corporation dissolved. This was accomplished and the engineering fund raising activities were given over to the University Alumni Association in 1964, when a new Engineering Alumni Association was initiated under the University Alumni Association. The success of the new Engineering Alumni Organization is illustrated by the fact that 269 engineers donated \$9,300 to the University Achievement Fund during 1962-63.

The Engineering Foundation Student Loan Fund now has assets of \$4,565, which has grown from the \$1,000 originally donated. Loans are usually about \$400 with simple interest of 4% due after graduation.

The number of engineering alumni was estimated at 2,000 in 1941. The 1948 Engineering Alumni Directory lists approximately 2,500 names; the 1955 Engineering Directory lists about 3,200 names; and the 1965 Engineering Alumni Directory lists about 7,000 names, including both undergraduate and graduate degrees. The total number of undergraduate degrees awarded in engineering from 1878 to 1967 is 6,721.

IV. THE RESEARCH

One of the many rewards to those teaching in a top-ranking engineering college is the challenging opportunity of research toward satisfying the curiosity of the teacher concerning some particular engineering theory or problem. Perhaps the research has no practical significance, but may satisfy the curiosity—or perhaps the research is of sufficient present interest to some agency outside of the College to include financial support of the projects, with the net result that valuable practical information may be obtained for the financial backer while the researcher's curiosity is also satisfied—at least partially.

Recognizing the need for an organization to stimulate, promote, and finance research, Dean H. B. Shaw, supported by President A. Ross Hill and the Board of Curators, wisely organized the Engineering Experiment Station in 1909. The Engineering Experiment Station was so constituted that it received grants by appropriations from the state legislature as well as from other public and private agencies. The Dean of the Engineering College was the Director of the Station and could allot funds for payment of research assistants, equipment and instruments, necessary travel expense of the staff, and publication of the research results in the "Bulletin of the Engineering Experiment Station." An excellent sampling of the variety of the research projects is given by the titles of the Engineering Bulletins beginning in 1910 and listed on pages 65, 66, and 67 and the titles of the reprint series beginning in 1959 and listed on pages 67, 68, 69, 70, 71, 72 and 73.

The Engineering Bulletin Series

Bulletin

No.

1. Acetylene for Lighting Country Homes, by J. D. Bowles (1910)
2. Water Supply for Country Homes, by K. A. McVey (1910)
3. Sanitation and Sewage Disposal for Country Homes, by W. C. Davidson (1910)
4. The Heating Value and Proximate Analysis of Missouri Coals, by C. W. Marx and Paul Schweitzer (1911)
5. Friction and Lubrication Testing Apparatus, by Allan E. Flowers (1911)
6. Test of Road Materials of Missouri, by W. S. Williams and Warren Roberts (1911)
7. The Use of Metal Conductors to Protect Buildings from Lightning, by E. W. Kellogg (1912)
8. Firing Test on Missouri Coal, By H. N. Sharp (1912)
9. A Report on Steam Boiler Trials Under Operating Conditions, by A. L. Westcott (1912)
10. Economics of Rural Distribution of Electric Power, by L. E. Hildebrand (1913)
11. Comparative Test of Cylinder Oils, by M. P. Weinbach (1913)
12. Artesian Waters of Missouri, by A. W. McCoy (1913)
13. Friction Test of Lubricating Greases and Oils, by A. L. Westcott (1913)
14. A Study of the Effects of Heat on Missouri Granites, by W. A. Tarr and L. M. Newmann (1913)
15. A Preliminary Study Relating to the Water Resources of Missouri, by T. J. Rodhouse (1914)

16. The Economics of Electric Cooking, by P. W. Gumaer (1915)
17. Earth Roads and the Oiling of Earth Roads, by H. A. LaRue (1916)
18. Heat transmission Through Boiler Tubes, by E. A. Fessenden and Jiles W. Haney (1913-14, 1914-15)
19. Geology of Missouri, by E. B. Branson (1919)
20. Energy Necessary to Shear Steel of High Temperature, by Guy D. Newton (1920)
21. Water Supply and Sewage Disposal for Country Homes, by E. J. McCaustland (1920)
22. Study Relating to the Water Resources of Missouri, by T. J. Rodhouse (1920)
23. Experiments on the Extraction and Recovery of Radium from American Carnotite Ores, by H. H. Barker and Herman Schlundt (1926)
24. The Grading of Earth Roads, by H. A. LaRue (1923)
25. Experiments on Sunflower Seed Oil, by H. E. French and R. O. Humphrey (1926)
26. Directory of Alumni and Former Students, College of Engineering (1926)
27. Tests on Lubricating Oils, by Dr. Mary V. Dover (1928)
28. Reinforced Brickwork, by Mason Vaughn (1928)
29. A Semi-Graphical Method of Analysis for Horizontally Curved Beams, by Robert B. B. Moorman, (1938)
30. Flood Flow on Missouri Streams, by Horace W. Wood, Jr. (1942)
31. Cross-Connection Survey in Calhoun County, Michigan, by E. L. Stockton (1942)
32. Cross-Connection Survey in Calhoun County, Michigan, by E. L. Stockton (1942) (Revised)
33. Supplemental Irrigation for Missouri and Regions of Similar Rainfall, by Harry Rubey (1945)
34. A New Transit Method for Realigning Railway Curves and Spirals, by Harry Rubey (1946)
35. Influence Lines for Horizontally Curved Fixed-end Beams of Circular-arc Plan, by Robert B. B. Moorman and Manford B. Tate (1947)
36. Stresses in a Uniformly Loaded Circular-arc I-Beam, by Robert B. B. Moorman (1947)
37. Thermodynamic Equilibrium Calculations for Combustion Jets, by Ralph Scoriah and Jack T. Kimbrell (1950)
38. The Effect of High Temperature Steam on a Nickel-Chromium-Iron Alloy, by Paul Ogden and Ralph Scoriah (1952)
39. Air and Water Pollution Conference (1955)
40. Selected Papers from the Air and Water Pollution Conference (1956)
41. Pressure Changes at Storm Drain Junctions, by W. M. Sangster, H. W. Wood, E. T. Smerdon, and H. G. Bossy (1958) (\$2.00, tables \$1.00)
42. Selected Papers from the Air and Water Pollution Conference (1957)
43. Proceedings of the Missouri Community Development Clinic, by J. Pitts Jarvis, Jr. (1958)
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45. Selected Papers from the Air and Water Pollution Conference (1958)
46. Field Testing and Analysis of Two Pre-Stressed Concrete Girders, by Adrian Pauw and John E. Breen (1959)
47. Proceedings of the Fifth Annual Air and Water Pollution Conference, by Ralph H. Lubbers (1959)

48. The Wood Charcoal Industry in the State of Missouri, by J. Pitts Jarvis, Jr. (1960)
49. An Investigation of the Flexural and Shearing Capacity of Reinforced Concrete Beams, by John E. Breen and Adrian Pauw (1960)
50. Proceedings of Conference on Utilization of Scientists and Engineers, by Robert M. Eastman (1960)
51. Selected Papers on Mechanization and Automation in Small Business, by James M. Beauchamp, Jr. (1961)
52. A Study of Precast Concrete Bridge Units, by John E. Breen and Adrian Pauw, (1961)
53. Proceeding of the Sixth Annual Air and Water Pollution Conference, by Ralph H. Luebbers (1961)
54. Proceedings of the Seventh Annual Air and Water Pollution Conference, by Lindon J. Murphy (1962)
55. Proceedings of the University of Missouri Fourteenth Annual Traffic Engineering Conference (1962)
56. A Review of Literature Pertaining to Creep and Shrinkage of Concrete, by Bernard L. Meyers (1963)
57. Aerobic and Anaerobic Digestion Characteristics of Livestock Wastes, Edgar A. Jeffrey, William C. Blackman, Jr. and Ralph L. Ricketts (1963)
58. Impact Study of a Steel I-Beam Highway Bridge, by James W. Baldwin Jr. (1964)
59. Digital Computer Analysis of Passive Networks Using Topological Formulas, by George W. Zobrist and Gladwyn V. Lago (1965)
60. Laboratory Equipment for Demonstration Electro-Mechanical Forces and Magnetic Circuits, by J. F. Lamb and J. R. Tudor (1965)
61. A Few Remarks Concerning the Flow of Fluid Under a Sluice Gate, by Charles Lenau (1965)
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63. Digital Computer Synthesis of Admittance Matrices of $N+1$ Nodes by Elmer A. Hoyer, George Perdikaris and George W. Zobrist (1967)
64. Design of Two-Dimensional Sharp-Edge-Throat Supersonic Nozzle by Digital Computer by John E. Pond and John Love (1967)

The Engineering Reprint Series

1. Response of Circuits to Steady-State Pulses by D. L. Waidelich. Reprinted from IRE Vol. 37, No. 12, December, 1949.
2. Heat Transfer to Water Boiling Under Pressure by E. A. Farber, and R. L. Scorah. Reprinted from ASME Transactions, May, 1948.
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10. A Dynamic Analogy for Foundation-Soil Systems by Adrian Pauw. Reprinted from Symposium on Dynamic Testing of Soils, Special Technical Publication No. 156, American Society for Testing Materials, 1953.
11. Ternary System Ethyl Alcohol—n—Heptane-Water at 30°C, by Joseph L. Scheppe, C. F. Braun and Co. and James R. Lorah. Reprinted from Industrial and Engineering Chemistry, Vol. 26, p. 2391, November 1954. The Rectifying Property of Polarized Barium Titanate, by Donald L. Waidelich. Reprinted from Journal of the Acoustical Society of America, Vol. 25, p. 796, July 1953.
12. Chip Breakers Studies 1, Design and Performance of Ground Chip Breakers, by Erik K. Henriksen.
 - Balanced Design Will Fit the Chip Breaker to the Job, from American Machinist, April 26, 1954, pp. 117-124, Special Report No. 360.
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 - Chip Breaking-A Study of Three-Dimensional Chip Flow, from page No. 53-5-9, presented at the A.S.M.E. Spring Meeting, Columbus, Ohio, April 28-30, 1953.
 - Economical Chip Breakers for Machining Steel, from Technical Aids to Small Business, May 1954, pp. 1-8.
13. The Design of Sampled-Data Feedback Systems by Gladwyn V. Lago, and John G. Truxal. Reprinted from Transactions of the A.I.E.E., Vol. 73, Part 2, p. 247, 1954.
14. Selection of Personnel by George W. Elliot. Reprinted from the 1954 Transcript of the Midwest Feed Production School.
15. Lightweight Aggregates for Structural Concrete by Adrian Pauw. Reprinted from the Proceedings of the A.S.C.E., Vol. 81, Separate No. 584, January 1955.
16. Coating Thickness Measurements Using Pulsed Eddy Currents by Donald L. Waidelich. Reprinted from the Proceedings of the National Electronics Conference, Vol. 10, February 1955.
17. Additions to Sample-Data Theory by G. V. Lago. Reprinted from the Proceedings of the National Electronics Conference, Vol. 10, February 1955.
18. Additions to Z-Transformation Theory for Sample-Data Systems by Gladwyn V. Lago. Reprinted from Transactions of the American Institute of Electrical Engineers, Vol. 74, January, 1955.
19. Tension Control for High Strength Structural Bolts by Adrian Pauw, and Leonard L. Howard, with a discussion on the Turn-of-the-Nut Method by E. J. Ruble. Reprinted from the Proceedings of the American Institute of Steel Construction, National Engineering Conference, April 18-19, 1955.

20. Autotransformer Better Motor Phase Conversion by Joseph C. Hogan. Reprinted from *Electrical World*, Vol. 144, p. 120, October 17, 1955.
21. Sequence Summation Factors by Adrian Pauw. Reprinted from the Proceedings of the American Society of Civil Engineers. Vol. 81, Paper No. 763, August, 1955.
22. Pulsed Eddy Currents Gage Plating Thickness by Donald L. Waidelech. Reprinted from *Electronics*, Vol. 28, p. 146, November, 1955.
23. Relay Protection for Lines Being Sleet-Melted by the Short-Circuit Method by J. C. Hogan, and C. G. Pebler. Reprinted from *Transactions of the American Institute of Electrical Engineers*, Vol. 74, December, 1955.
24. Supplemental Irrigation . . . Careful Planning is Essential by Harry Rubey. Reprinted from *What's New in Crops and Soils*, Vol. 7, August-September, 1955.
25. Analysis of Single-Phase-to-Three-Phase Static Phase Converters by J. C. Hogan. Reprinted from *Transactions of the American Institute of Electrical Engineers*, Vol. 74, p. 403, January, 1956.
26. Enrollment and Incomes in Civil Engineering can be Increased by Harry Rubey. Reprinted from *Journal of Engineering Education*, Vol. 46, p. 236, November, 1955.
27. A Synthesis Procedure for Sampled Data Systems by G. V. Lago. Reprinted from *Proc. National Electronic Conf.* Vol. II, p. 361, 1965.
28. Design of Optimum Phase-Shift Oscillators by Donald L. Waidelech. Reprinted from *Proceedings of the National Electronics Conference*, Vol. II, p. 222, 1955. This article also appeared in *Electronics Equipment*, Vol. 4, p. 38, April, 1956.
29. Investigation Concerning Polarization in Barium Titanate Ceramics by G. W. Marks, Donald L. Waidelech, and L. A. Monson. Reprinted from *Transactions of the American Institute of Electrical Engineers*, Vol. 75, Part I, p. 469, 1956.
30. The Influence of Shank Area on the Tensile Impact Strength of Bolts by John Love, Jr., and O. A. Pringle. Reprinted from *Transactions of the American Society of Mechanical Engineers*, Vol. 78, p. 1489, October, 1956.
31. Measurement of Coating Thicknesses by Use of Pulsed Eddy Currents by Donald L. Waidelech. Reprinted from *Nondestructive Testing*, Vol. 14, p. 14, May-June, 1956.
32. Head Losses in Storm Drain Junction Boxes by Horace W. Wood. Reprinted from *Highway Research Board Proceedings*, Vol. 35, p. 177, 1956.
33. Stability of Laminar Flow in Curved Channels by Chia-Shun Yih, and W. M. Sangster. Reprint from the *Philosophical Magazine*, Volume 2, Eighth Series, Page 305, March 1957.
34. Viscosity of Suspensions of Spherical and Other Isodimensional Particles in Liquids by Andrew Pusheng Ting, and Ralph H. Luebbers. Reprinted from the *American Institute of Chemical Engineers Journal*, Volume 3, Page 111, March, 1957.
35. Irrigation-Drainage-Climatology for Flat Humid Land by Harry Rubey. Reprinted from the *Proceedings of the American Society of Civil Engineers*, Volume 83, Paper No. 1253, May, 1957.
36. The Impedance of a Coil Near a Conductor by D. L. Waidelech, and C. J. Renken, Jr. Reprinted from the *Proceedings of the National Electronics Conference*, Volume 12, Page 188, 1956.

37. Automatic Control - The Fundamentals by Gladwyn Lago. Reprinted from the Proceedings of the Second Annual Conference on Automatic Control, University of Oklahoma, April 29-30, 1957, Page 9.
38. Non-Aqueous Solvent Electrochemical Systems, by G. Myron Arcand, and James R. Tudor. Reprinted from Proceedings of Eleventh Annual Battery Research and Development Conference, Power Sources Division, United States Army, Signal Engineering Laboratories, Fort Monmouth, New Jersey, May 22-23, 1956, pages 16-19.
39. Compensation of Sampled-Data Systems by L. M. Benningfield, and G. V. Lago. Reprinted from Proceedings of the National Electronics Conference, Volume XIII, Hotel Sherman, Chicago, Illinois, October 7, 8, 9, 1957, pages 888-897.
40. A. Application of the Smith Chart to the Design of Microwave Absorbing Materials by D. L. Waidelich.
B. Synthesis of Control Systems Based on an Approximation to a Third-Order System by C. R. Hausenbauer, and G. V. Lago. A paper presented at AIEE Summer General Meeting and Air Transportation Conference, Buffalo, N. Y., June 22-27, 1958.
41. A. Reduction of Probe-Spacing Effect in Pulsed Eddy Current Testing by Donald L. Waidelich.
B. Minimizing the Effect of Probe-to-Metal Spacing in Eddy Current Testing by C. J. Renken, Jr., and D. L. Waidelich. Reprints from Symposium on Nondestructive Tests in the Field of Nuclear Energy. American Society for Testing Materials, 1958.
42. A system of Gaging Plating Thickness by R. G. Myers, and D. L. Waidelich. Reprinted from Transactions of the American Institute of Electrical Engineering, Vol. 77, Part I, p. 770, 1958.
43. Network Analyzer Measurement of the Mesh Equivalent of a Complex Circuit by J. C. Hogan, and V. E. Verrall.
44. The Design of a Single-Layer Microwave Absorbing Material by D. L. Waidelich. Reprinted from Volume XIV, Proceedings of the National Electronics Conference, Hotel Sherman, Chicago, Illinois, October 13, 14, 15, 1968.
45. Pressure Changes at Open Junctions in Conduits by William M. Sangster, Horace W. Wood, Ernest T. Smerdon, and Herbert G. Bossy. Reprinted from Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, 2057, June, 1959. HY6.
46. The Mutual Impedance of Perpendicular Half-Wave Antennas by D. R. Capp and D. L. Waidelich. Reprinted from Proceedings of the National Electronics Conference, Volume XV, Hotel Sherman, Chicago, Illinois, October 13, 14, 15, 1959.
47. The Bandwidth of a Single Layer Absorbing Material by B. W. Sherman, and D. L. Waidelich, P.E. Reprinted from Volume I of the Proceedings of the Second Annual RADC International RAM Symposium 9, 10, and 11 June 1959, Rome Air Development Center, Griffith Air Force Base, N.Y.
48. Measuring Equivalent Circuits by J. C. Hogan, and V. E. Verrall. Reprinted from Volume XXII, Proceedings of the American Power Conference.
49. Dewatering Rates For Digested Sludge in Lagoons by Edgar A. Jeffrey. Reprinted from Journal Water Pollution Control Federation, November 1960, Washington, 16, D.C.

50. Static Modulus of Elasticity of Concrete as Affected by Density by Adrian Pauw. Reprinted from American Concrete Institute Journal, Title No. 57-32; V. 32; No. 6, December 1960 (Proceedings V. 57), P. O. Box 4754, Redford Station, Detroit 19, Michigan.
51. The Application of the Principle of Corresponding States for Polar Substances by Truman S. Storvick, and J. M. Smith. Reprinted from Journal of Chemical and Engineering Data, Vol. 6, No. 1, January 1961.
52. Loosening of Bolted Joints by Small Plastic Deformations by O. A. Pringle, P. E. Presented at the Winter Annual Meeting, New York, N. Y., Nov. 27 - Dec. 2, 1960, of the American Society of Mechanical Engineers. Paper No. 60-WA-116.
53. Thermodynamic Properties of n-Propyl Alcohol by J. L. Cosner, J. E. Gagliardo and T. S. Storvick. Reprinted from Journal of Chemical & Engineering Data, Vol. 6, No. 3 July, 1961.
54. An Evaluation of the Overhead Projector in Teaching Kinematics by Richard P. Covert. Reprinted from The Journal of Engineering Education, Vol. 51, No. 10, June 1961.
*Out of Print
55. Transfer of Load Between Precast Bridge Slabs by Adrian Pauw, P. E. and John E. Breen. Reprinted from Bulletin 279 (1961) Highway Research Board, Washington, D. C.
56. The Present Status of Structural Lightweight Concrete in the U.S.A. by Adrian Pauw. Reprinted from "De Ingenieur," Vol. 73, No. 34, Aug. 25, 1961, The Netherlands.
57. Field Testing of Two Prestressed Concrete Girders by Adrian Pauw, and John E. Breen. Reprinted from Highway Research Board Bulletin 307, National Academy of Sciences—National Research Council Publication 937, pages 42-63, 1961.
58. Controlled-Deflection Design Method for Reinforced Concrete Beams and Slabs by Adrian Pauw. Reprinted from Journal of The American Concrete Institute, Vol. 59, No. 5, May 1962.
59. The Impedance of a Coil Placed on a Conducting Plane by T. J. Russell, V. E. Schuster, and D. L. Waidelich. Reprinted from AIEE Winter General Meeting, New York, N. Y., January 28 - February 2, 1962.
60. Discussion of an Article by G. S. Ramswamy and M. Ramaiah: Characteristic Equation of Cylindrical Shells—A Simplified Method of Solution by Adrian Pauw, and W. M. Sangster. Reprinted from Journal of The American Concrete Institute Concrete Briefs, pages 1505-1509, October 1962.
61. Dissolution Rates of Uranium Dioxide Sintered Pellets in Nitric Acid Systems by R. F. Taylor, E. W. Sharratt, L. E. M. de Chazal, and D. H. Logsdial. Reprinted from Journal of Applied Chemistry, Published by the Society of Chemical Industry, Volume 13, No. 1, January 1963, Pages 32-40.
62. Circuit Waveforms for Periodic Waves by D. L. Waidelich. Reprinted from Communication and Electronics, March 1963.
63. Transmission Losses and Economy Loading by the Use of Admittance Constants by J. R. Tudor, and W. A. Lewis. Reprinted from Power Apparatus and Systems, IEEE, October, 1963.
64. Application of Thermoacoustic Phenomena to MHD Conversion Systems by R. L. Carter, K. T. Feldman, Jr., and C. N. McKinnon, Jr. Reprinted from Fifth Symposium on the Engineering Aspects of Magnetohydrodynamics MIT, April 1 & 2, 1964.

65. Three and Four Coil Systems for Homogeneous Magnetic Fields by M. E. Pittman and D. L. Waidehlich. Reprinted from IEEE Transactions on Aerospace, February, 1964.
66. Variable-Mesh Difference Equation for the Stream Function in Axially Symmetric Flow by J. C. Lysen. Reprinted from AIAA Journal, 1964.
67. Creep of Concrete: Influencing Factors and Prediction by A. M. Neville, and B. L. Meyers.
Effect of Creep and Shrinkage on the Behavior of Reinforced Concrete Members by A. Pauw, and B. L. Meyers. Reprinted from Symposium on Creep on Concrete, Publication SP-9, The American Concrete Institute.
68. A Method of Data List Processing with Application to EEG Analysis by C. M. Philpott, and G. B. Lago. Reprinted from Communications of the ACM, Volume 8, Number 5, May, 1965.
69. Method for Obtaining the Trees of a v Vertex Complete Graph from the Trees of a $v-1$ Vertex Complete Graph by G. W. Zobrist, and G. V. Lago. Reprinted from the Matrix and Tensor Quarterly, Volume 15, Number 3, March, 1965.
70. Treatment of Livestock Waste-A Laboratory Study by E. A. Jeffrey, W. C. Blackmann, Jr., and Ralph Ricketts. Reprinted from Transactions of the ASAE, Volume 8, Number 1.
71. The Electronic Position Indicator by Richard P. Covert. Reprinted from The Journal of Industrial Engineering, Volume XVI, No. 4, July-August, 1965, pages 255-259.
72. The Reflected Impedance of a Circular Coil in the Proximity of a Semi-Infinite Medium by David H. S. Cheng. Reprinted from IEEE Transactions on Instrumentation and Measurement, Volume IM-14, Number 3, September, 1965.
73. Irrotational Flow Over Spillways of Finite Height by John J. Cassidy. Reprinted from Journal of the Engineering Mechanics Division, Proceedings of the American Society of Civil Engineers, Volume 91, Number EM6, December, 1965.
74. Experimental Investigation of a Magnetically Balanced Arc in a Transverse Argon Flow by T. W. Myers, C. N. McKinnon, and J. C. Lysen. Reprinted from Journal of Engineering for Power, January, 1966.
75. A Study of the Effects of Paced Audio-Rhythm on Repetitive Motion by John A. Conte. Reprinted from The Journal of Industrial Engineering, Volume XVII, Number 3, 1966.
76. Measured and Computed Stresses in Three Castellated Beams by Richard T. Douty, and James W. Baldwin. Reprinted from AISC Journal, January, 1966.
77. A Method of Obtaining a Uniform Electric Field by A. V. Dralle and D. L. Waidehlich. Reprinted from 1966 IEEE International Convention Record, Part 7.
78. The Use of the Flux Plot in Traffic Control by Robert J. Wheeler and Elmer M. Tory. Reprinted from the Traffic Quarterly, July 1965.
79. A Statistical Definition of Perfect Mixtures of Solids of Different Sizes by Kun Sup Hyun and L. E. Marc De Chazal. Reprinted from I & EC Process Design and Development, Vol. 5, April 1966.
80. A Qualitative and Quantitative Measure of Aufwuchs Production, by Darrell L. King, and Robert C. Ball. Reprinted from Trans. Amer. Micros. Soc. 85 (2): 232-240. 1966.

81. Heterogeneous Catalysis: Effect of an Alternating Electric Field by Vin-Jang Lee. Reprinted from Science, April 22, 1966, Vol. 152, No. 3721, page 514.
82. Methods of Measuring Electric Fields by Byron W. Sherman, and Donald L. Waidelich. Reprinted from Supplement to IEEE Transactions on Aerospace and Electronic Systems, Vol. AES-2, No. 6, Nov. 1966.
83. Three Generation, by M. T. Jong, C. E. Lau, and George W. Zobrist. Reprinted from Electronics Letters, Vol. 2, No. 8, August 1966.
84. Determination of Diffusion Coefficients from Viscosity Measurements: Effect of Higher Chapman-Enskog Approximations, T. S. Storvick, and E. A. Mason. Reprinted from The Journal of Chemical Physics, Vol. 45, No. 10, November, 1966.

A good indication of the growing importance of research in the College of Engineering is the increasing expenditures of the Engineering Experiment Station given in the tabulation below. Of additional interest is the tabulation of the total expenditures of the College of Engineering (exclusive of the Agricultural Engineering Department and that of the Experiment Station). The research and operating budgets of the Agricultural Engineering Department is included in the budget of the College of Agriculture while the curriculum in Agricultural Engineering is authorized by the faculty of the College of Engineering.

Full-time, nine-month average teaching salaries for professors and instructors for several years were as follows: 1936-\$4,460 and \$1,900; 1948-\$5,300 and \$2,700; 1954-\$7,700 and \$3,500; and in 1959-\$9,900 and \$5,560.

Because of the growing importance of research and the resulting need of administrative assistance, in 1954 Dean Croft appointed Donald Waidelich, professor of electrical engineering, as Associate Director of the Experiment Station. Two years later, because of added duties in the Electrical Engineering Department, Waidelich was relieved of this responsibility and was replaced by J. Pitts Jarvis in 1955. Jarvis was replaced by William Sangster in 1963 who in turn relinquished his duties to John Lysen in 1966. Much of the success in the growth of research support funds from outside agencies was due to the continued effort of Dean Hogan, Associate Dean Sangster, and Professor Lysen, research coordinator and associate director of the Experiment Station.

In 1940, about twenty research projects were under study. The various programs included a study of soils for the State Highway Commission, studies for the State Board of Health, the Portland Cement Association, the Doane Agricultural Service, and the Quaker Oats Company. Those programs continued until the United States entered World War II on December 8, 1941. All research was discontinued then, except a special study for the Civil Aeronautics Board on soil mechanics.

In 1946, Dean Curtis reported that the Experiment Station was reorganized and that "about a dozen" projects were under way. In 1947, he reported that extremely heavy teaching loads, lack of personnel and space were severe handicaps to research development. However, if one refers to the list of Bulletins of the Experiment Station on page 65, it will be seen that publication of research projects began to reappear in 1945. In 1949, Dean Curtis reported that there were some 30 research projects supported by Experiment Station funds; and in 1950, some 22 projects were under study by various faculty members.

Engineering Experiment Station - College of Engineering
1940-41

Expenditures	6,642	Salaries	97,485
"Engineering Sales"	8,550	Expense & Equipment	26,299
Research Grants	1,876	Special Equipment	45,323
Total	\$ 17,068	Total	\$ 169,107

1950-51

Salaries	6,200	Salaries	230,452
Other Expenditures	5,600	Other Expenditures	32,117
Total	\$ 11,800	Total	\$ 262,569

1960-61

Salaries	31,580	Salaries	354,287
Other Expenditures	9,734	Other Expenditures	47,989
A	\$ 41,314	Total	\$ 402,276

From Grants

Salaries	36,526
Other Expenditures	53,590
B	\$ 90,116
Total A & B	\$131,430

1965-66

Salaries	162,039	Salaries	907,662
Other Expenditures	20,414	Other Expenditures	157,178
A	\$182,153	Total	\$1,064,840

"Organized Research"

Salaries	268,249
Other Expenditures	143,739
B	\$411,988
Total A & B	\$594,141

1966-67

Salaries	240,750	Salaries	1,087,257
Other Expenditures	28,693	Other Expenditures	178,098
A	\$269,443	Total	\$1,265,355

Sponsored Research

Salaries	245,552
Other Expenditures	74,350
B	\$319,902

Unsponsored Research

Salaries	94,939
Other Expenditures	81,211
C	\$176,150
Total A, B, & C	\$765,495

Beginning in 1954, the size of cooperative research grants was recorded in the Dean's Annual Report to the President. In this year, Adrian Pauw received a two-year grant of \$32,000 from the Air Force for a study of fire extinguishment, and a grant of \$6,600 for a study on force relaxation methods; Horace Wood received a grant of \$4,600 from the State Highway Commission for research on storm drain junction boxes; Donald Waidelich received a grant of \$11,000 from the Argonne National Laboratory for research on the measuring of the thickness

of materials by using electrical eddy currents; Adrian Pauw received a grant of \$16,000 for studying the economics of precast bridge structures, \$6,000 for model studies on box girders, another \$33,000 for research on pressure containment in air craft; and Horace Wood received a further grant of \$30,000 for continuing research on storm drain junction boxes.

In 1955, James Tudor received a grant of \$17,000 from the Signal Corps to undertake research on low temperature batteries; Adrian Pauw received a grant of \$8,000 for continuing work on relaxation methods, and a continuing grant of \$17,000 for the precast bridge member project; a continuing grant of \$46,000 was made to Horace Wood for the junction box study; and Donald Waidelich received a continuing grant of \$11,000 for the study of eddy currents. During 1956, Gladwyn Lago was studying feedback systems supported by a grant of \$10,500 from the National Science Foundation; Lindon Murphy was studying a mechanical aerator for the State Department of Health with a grant of \$1500. In 1956, James Tudor received another grant of \$37,900 for a three-year continuation of the study on low temperature batteries ending in 1959; Adrian Pauw received a grant of \$3500 for field testing of precast girders during 1958; and a grant of \$34,300 was made to Donald Waidelich by the National Science Foundation for a study of equivalent circuits for a probe coil during 1958-60.

A research project with an expanded field of interest was initiated in 1957, supported by the Experiment Station, with the formation and incorporation of the Mid-Missouri Development Council. This was an organized group of 13 center-of-state counties including an area of 7,082 square miles and a population estimated at 232,500 (1960) in 34 communities. Intensely interested in attracting industries to the area, this group recognized the importance of having economic data available for those industries possibly interested in this area. The officers of the corporation were: C. I. Harper (a banker of Sturgeon), president; J. M. Alton (a Columbia auto dealer), vice-president; Travis John (a Vienna banker), secretary-treasurer; and Robert M. Eastman (chairman of the College's Department of Industrial Engineering), project director. Four years later (May, 1961), with the aid of a \$13,000 grant from the Council (and many graduate student man-hours spent traveling and interviewing), an attractive 148-page Industrial Survey brochure of the area was published. This, the first industrial survey undertaken by the University, has served as a model for surveys undertaken by other groups.

In 1959, Adrian Pauw continued his projects for the State Highway Commission on prestressed highway girders, precast highway girders, and creep and shrinkage (1961-62); Lindon Murphy was writing a booklet on safe plumbing for the State Plumbing and Heating Committee; and Donald Waidelich was continuing his work in equivalent circuits for a probe coil with the support of the National Science Foundation. During the 1961-63 interval, Gladwyn Lago with a grant from the National Institute of Health was devising means for electronic data processing of ERG patterns; James Baldwin was studying the effects of impact loading on steel I-beam bridges; and Edgar Jeffrey was determining design criteria for livestock waste lagoons with support funds from the National Institute of Health.

The number of research projects increased so rapidly beginning in 1962 that the description of the project has been limited somewhat to indicate whether the support funds were 1) internally (state supported) or externally supported; 2) the Department involved; 3) the project director; 4) the year the project was initiated; and 5) the project title. Those projects were:

Chemical Engineering (internal funds) (67) interfacial resistance to mass transport—deChazal; heterogeneous analysis, effect of an electric field—Lee; adaptive feed for a dynamic control—Luecke; mass transport from vibrating bubbles—Preckshot; and the analysis of the catalytic action of a distributed crystal field—Lee.

Chemical Engineering (External funds) (62) P-V-T properties of polar substances—Storvick; thermal conductivity of polar gases at high pressure—Storvick; (63) effect of heavy metals on the operation of stabilization lagoons—Luebbers; trickling filter studies—Luebbers; viscosity of polyatomic polar gases at high pressures—Storvick; drops from submerged nozzles—de Chazal; properties of binary liquid mixtures at high pressures—Storvick; (65) effect of trace metals on waste stabilization in lagoons—Luebbers; inactive and boiling heat transfer under high centrifugal accelerations—Preckshot; condensation on horizontal rotating cylinders—Preckshot; (66) drop formation and interface at zero gravity—de Chazal; high temperature, high pressure thermal conductivity of polar gases—Storvick; P-V-T properties of binary liquid mixtures at high pressures—Winnick; and (67) properties of polyatomic gas mixtures—Storvick.

Civil Engineering (Internal Funds) (64) investigation of cost accounting with critical path techniques—Milner; (66) direct design of rigid frames—Douty; (67) direct solution for the bearing capacity of soils—Abdul-Baki; design of an optimum spillway shape—Lenau; and the dynamics of structural steel frames—Salane.

Civil Engineering (External Funds) (54) head losses in storm drain junction boxes—Wood; (55) structural and economic studies of precast bridge units—Meyers; (57) basic research on force relaxation methods—Pauw; (59) plumbing research—Murphy; (61) effect of creep and shrinkage on the deflection of reinforced concrete bridges—Pauw; impact study of a steel I-beam highway bridge—Baldwin; (62) plate test for determining shear resistance of concrete—Pauw; (63) ion exchange for advanced waste treatment—Ray; ground water pollution from waste water reclamation—Ray; reinforced plastic concrete forms—Milner; effect of lagoon effluent on livestock—Ray; tests on castellated beams—Baldwin; comparative bond tests—Baldwin; experimental studies on shell structures—Buchert; flow characteristics over a curved spillway—Cassidy; radiation activity in bottom sediment—Hemphill; biological and physical relationships of oxydation lagoons—Ward; waste treatment and disposal lagoons in Missouri—Ward; waste disposal of car wash facilities—Ward; (65) analysis of two component castellated beams—Douty; doubly curved stiffened shells—Buchert; resistance to flow in pipes as a function of biological growths—Cassidy; metabolic degradation of materials in a waste stabilization lagoon—King; deformation of steel beams related to permitted highway bridge overloads—Salmons; study of composite bridge structures—Baldwin; study of traffic generators in Columbia—Wheeler (66) analysis of spillway sections—Lenau; analysis of distributed parameter system—Angus; (66) analysis of irrotational free-surface flow over a spillway in a gravity

field—Cassidy; the use of lightweight spherical particles for discharge in open channels—Liu; a systems approach to river basin development—Ray; the effects of grades on the capacity of urban freeways—Wheeler; study of precast-prestressed composite bridge stringers—Dallam; the role of heterotropic biotic populations in reducing organic contaminations—King; (67) prediction of permanent camber on bridges—Pauw; gas-surface interactions—Harris; ecology of stream biotics in waste assimilations—King; and the effect of radio vibrations on aereated biological systems—Hemphill.

Electrical Engineering (Internal Funds) (62) thermoacoustic phenomena—Carter; (65) analysis and simulation of filtered noise for modulation and demonstration—Dwyer; coding for Markov sources—Dwyer; application of computers to power systems problems—Tudor; digital simulation of discontinuous phenomena—Weathers; tree generation—Zobrist; (66) power system fault current wave from analysis—Tudor; (67) adaptive and learning control systems—McLaren; and totally implantable microelectronic temperature transmitter—Combs.

Electrical Engineering (External Funds) (55) development of equipment for laboratory teaching of electromechanical conversion principles—Waidelich; electro-mechanical systems for use in low temperature batteries—Tudor; (56) sampled data feedback systems—Lago; (57) impedance and equivalent circuit of a probe coil near a plane conductor—Waidelich; (58) ground systems of UHF antennas—Waidelich; (62) development of equipment for showing forces in conductors in magnetic fields—Lamb and Tudor; (64) electronic data processing of EEG patterns—Lago; (65) digital simulation of EEG utilizing a Markov process—Lago; curvilinear antenna arrays—Cheng; electrical properties of evaporated gallium arsenide—Charlson; pulse electromagnetic probes—Waidelich; (66) energy conversion systems—Tudor; laser acoustical probe for gases—Carter; sensitivity analysis—Zobrist; stability analysis of brushless motors—Hoft; (67) open and closed loop techniques for computer controlled instrumentation—Brubaker; data evaluation, computer simulation, and systems design—Adams; EEG pattern recognition—Lago; and ASAP conversion—Zobrist.

Industrial Engineering (Internal Funds) (65) a mathematical model of a teaching hospital—Covert; (66) technological change in machine replacement policy—Eastman; a comparison of methods for obtaining velocity and acceleration data from posional data—Covert; and (67) video analysis of a surgical operation—Miller.

Industrial Engineering (External Funds) (60) industrial survey—Eastman; (63) metal working industry survey—Beauchamp; Missouri Division of Commerce and Industrial Department—Eastman; a systems model of an operating radiology department—Eastman; and (67) operation research and systems design—Eastman.

Mechanical Engineering (Internal Funds) (65) optimization in spacecraft structure design—Stickney; hemodynamic simulation with flow in elastic tubes—Harris; extension of the application of photometric methods in the measurement of transport phenomena—Love; (66) high velocity impact—Miller; (67) two stream turbulent-jet mixing region—Miles; solid fueled combustion laster—McKinnon; solar calorimeter—Moore; flame quenching at non-atmospheric pressures—Love; and the fatigue strength behavior of polymeric materials—Pringle.

Mechanical Engineering (External funds) (60) powder metallurgy for thermo-electric components—Stevens; generalized flow in conduits—Scorah; support of a research reactor—Croft and Emmons; (64) evaluation of cardiac valve homografts—Young; (65) transition point location of a rotating center body in an annular inlet—Lysen; the similarity parameter and virial and kinematic viscosity for two stream turbulent jet-mixing region—Miles; undergraduate instructional scientific equipment—Bolstad; high-energy rate forming—Gibson; (66) NDEA/NSF/NASA graduate fellowship—Bolstad; fatigue failure under high vacuum conditions—Creighton; pulsed MDH energy conversion—McKinnon; magnetically loaded explosives—McKinnon; (67) seeded high-explosive plasmas—McKinnon; and central administration of research—Lysen.

Nuclear Engineering (Internal Funds) (65) Nuclear characteristics of the MU reactor—Morgan; reactor leakage neutron spectrum measurement—Dowdy; highly excited bound states in nuclei using nuclear resonance—Dowdy; and (66) transient heat transfer in reactor channels—Morgan.

Engineering research requires not only imagination and analytical thinking of talented men, but also sophisticated instrumentation and experimental devices. Examination of the list of Experiment Station Bulletins on pages 65 and 66 reveals that the research performed from the founding of the Station in 1909 to the beginning of World War II in 1941 (Bulletins No. 1-29 inclusive), outside of one or two projects, did not require sophisticated instrumentation as known today. Transducers and recorders of various types developed during the war became available at its end in 1945 for research in universities.

The College of Engineering received its share of war surplus equipment and instruments. For example, the Container Corp. donated a constant-temperature and constant-humidity room. Testing machines, temperature and pressure recorders, and machine tools of various types were received as donations or were purchased, perhaps at 40% of the actual value, from the War Assets Corp. In the period 1943-1948 some \$220,000 worth of equipment was received for about \$100,000 of state money. In fact, the laboratories became so short of space that much of the apparatus had to be stored until the new Electrical Engineering Building became available in 1958.

Many private corporations donated gas turbines, electrical and chemical equipment or money to support the purchase of research apparatus. The largest donation came from those interested in the electrical utility field. In 1956, Clifford Wallis and Huber Croft decided that an electric network analyzer would be a useful research tool and, together with Joseph Hogan and James Tudor, approached officers of the Arkansas-Missouri Power Co., the Central Electric Power Coop., the A. B. Chance Co., the Empire District Electric Co., the Kansas City Power and Light Co., the M. and A. Electric Power Coop., the Missouri Public Service Co., the Missouri Utilities Co., the Saint Joseph Light and Power Co., Sverdrup and Parcel Inc., and the Union Electric Co. The result was that some \$110,000 was donated by these companies to purchase the analyzer. The operating charges for solving network problems were paid for by the users. Between 1957 and 1967, 186 problems were solved.

Perhaps the general research equipment most challenging to the staff of the entire University was the research reactor facility. At the close of World War II,

the U. S. Atomic Energy Commission was organized. Much of the basic scientific information obtained by the Manhattan project for developing the atomic bomb was made available to universities by the A. E. C. In 1955, as a result of this stimulus, Dean Croft requested President Ellis to appoint a University-wide committee. This research reactor committee consisted of Dean Bent (graduate college and chemistry), Professor Gingrich (physics), Professor Brody (agriculture), and Dean Croft as chairman, adding later Dean Francis English (arts & science), Dean Longwell (agriculture), and Dr. Lodwick (medicine). In 1957, the committee recommended that a research reactor facility be built, for research by all divisions of the University including engineering, and in 1959 the legislature passed and Governor Blair signed an appropriation bill for \$1,250,000. In 1960, the committee was extremely fortunate in employing Ardath Emmons as the director of the facility. Emmons assisted the Internuclear Co. of St. Louis in designing the reactor, helped Gabler and Associates of Detroit in designing the building, and successfully obtained \$615,000 from the National Science Foundation and \$150,000 from the National Institute of Health. President Ellis and the Board of Curators then obtained additional University money to complete the \$3,230,000 fund for building the reactor facility. The building and the reactor were completed for five megawatt operation in 1965 and went critical in October, 1966. The reactor now operates 16 hours a day, with all 14 laboratories occupied. The reactor power will probably be increased from a five to a ten megawatt capacity in 1970.

Another major addition to the research capabilities as well as to the instrumentation for both graduate and undergraduate instruction was the computer installation. In 1962, Dean Hogan arranged for the installation of an IBM-360-40 in 1966. Since the use and programming of computers is required for all engineering students, the students continue to experience the most recent computer developments.

In addition to the major research facilities mentioned in previous paragraphs, each department added to its research and educational instruments and apparatus as detailed in following paragraphs.

Due to the efforts of Gerhard Beyer, for example, the Chemical Engineering Department received a grant of \$35,300 in 1958 from the Atomic Energy Commission, to purchase a "pickle barrel" sub-critical apparatus with a variety of neutron measuring instruments. This was followed by further grants of \$5,200 and \$35,000 in 1959 from the A. E. C. to purchase other instruments including a multi-channel analyzer and a gas-liquid chromatograph for the isotope laboratory. Truman Storvick obtained grants totalling some \$216,000 from the National Science Foundation, beginning in 1961, to obtain basic P-V-T viscosity, and heat conductivity of gases at 400° C and 7500 psi in equipment designed and built under his direction, costing approximately \$190,000.

Since 1958, the research facilities of the Civil Engineering Department have increased considerably. The test frame (designed by Adrian Pauw and built into the reinforced concrete structure of the new addition to the civil engineering laboratory) was equipped with \$120,000 in hydraulic loading and electronic recording devices, and designed by Adrian Pauw and James Baldwin. John Cassidy designed and installed apparatus in the fluid mechanics laboratory, consisting of a 3' x 3' wind tunnel (\$11,000); a tilting flume (\$6,000); a fixed flume (\$5,000); a

hot-wire anemometer, constant T. channel (\$7,000); and a two-dimensional water tunnel (\$2,000). Arliss Ray supervised the building of a 25' x 50' steel building costing \$30,000 in Research Park for expansion of the sanitary engineering laboratory and has added two environmental chambers (\$3,000); a spectroscope (\$3,500); carbon analyzers (\$6,500); and two Warburg analyzers (\$4,000). In the Soil Mechanics Laboratory, Karl Evans has supervised the purchase of two triaxial testing machines (\$3,900); two consolidometers (\$2,800); a triaxial shear apparatus (\$1,300); a Mettler balance (\$2,500); and a direct shear apparatus and an unconfined compression apparatus (\$1,320).

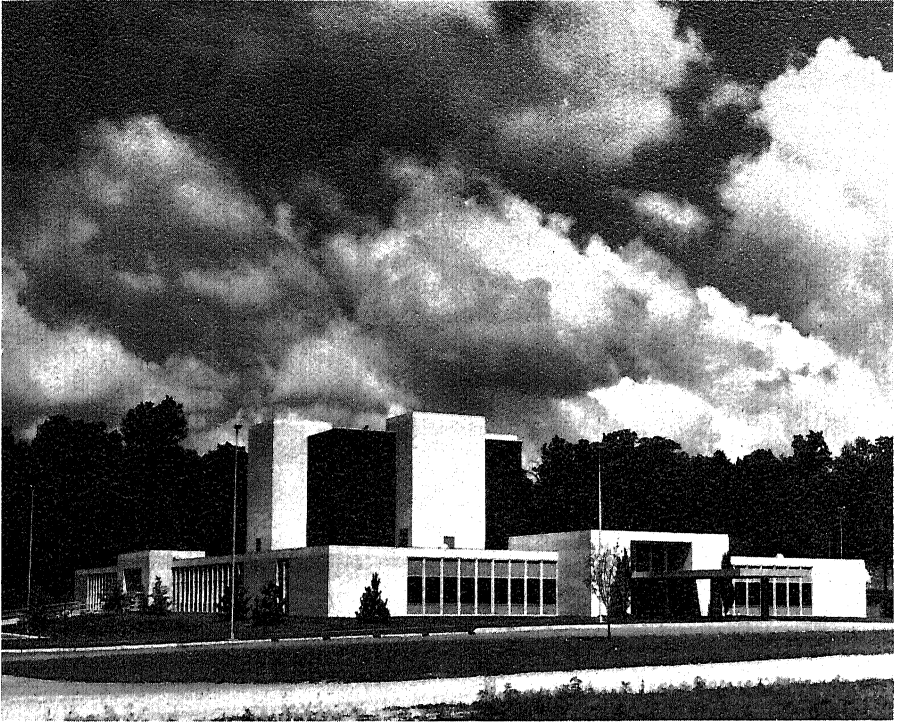
In the Electrical Engineering Department, expenditures for research and educational instruments and devices included: diffusion furnace \$5,200; a high vacuum system \$3,500; servoscope \$4,700; oscillators \$6,000; vacuum coater \$6,200; low frequency generators \$4,500; various types of recorders, \$6,300; voltmeters, anemeters, watt meters, \$9,200; pulse ware equipment, \$3,400; electric oven, \$2,700; motor generator set \$2,200; pulse generating apparatus, \$7,200; and various types of oscilloscopes, \$21,500.

During the 10-year period between 1950 and 1960, the Mechanical Engineering Department obtained the following major additions to research instruments and apparatus; a Leitz microscope (\$12,000); a B & L microscope (\$2,400); a tensile testing machine (\$2,000); an Ajax induction furnace (\$5,000); a low velocity wind tunnel (\$3,000); a magnet and plasma device (\$12,000); a 3-channel Sanborn recorder (\$3,800); an oscilloscope (\$3,500); a Visicorder (\$7,000); three recorders (\$17,100); a Fortex camera (\$4,000); a hot wire anemometer (\$3,000); a helium leak detector (\$2,500); a gas engine (\$2,000); two high-pressure compressors (\$2,000); and an ion vacuum pump (\$2,800).

Competent and efficient research demands that an adequate library with a skilled librarian be near at hand. Three years before the establishment of the Engineering Experiment Station in 1909, the Engineering Library was formed, but it was not until 1915 that a full-time librarian was engaged. In 1937, the library had approximately 11,000 volumes and was moved from the main assembly hall in the Engineering Building to the second floor of the recently completed Engineering Laboratories Building where it is now located in expanded though still crowded quarters. The number of books and bound volumes increased considerably with the years: 1940 - 12,500; 1949 - 16,000; 1960 - 25,000; and 1967 - 30,000. The College has been fortunate in having the services of Webster Wheelock as the librarian since 1955.

In 1962, President Ellis and the Board of Curators realized that land space for future expansion of research organizations would be needed soon, so they engaged C. L. T. Gabler, architect for the research reactor, to draw up plans for such an area. Mr. Gabler and Ardath Emmons, director of the research reactor facility to be located in the proposed area, visited several possible sites and finally recommended as the best location an 85-acre tract about one-half mile south and west of the stadium on Route K. The Board of Curators then designated this area as Research Park. At this writing (1968), in addition to the research reactor, the following research buildings are located in Research Park: Animal Psychology (two-story), Research Animal (one story), Biological Control Laboratory (one story), Space Science Research Center (three stories), Botany Green House (one

story), and the Research Park Development Building (one story). At the present time, a well-known chemical company is considering construction of its own building in Research Park, apparently attracted by the research reactor's ability to produce short-lived isotopes. This justifies the 1955 prediction that industry would find it advantageous to locate near the reactor.



The Research Reactor and Laboratories (1965)

The 1922 Engineering Laboratory Building housed the laboratory facilities of the Civil Engineering Department and the machine, forge and wood shops of the Mechanical Engineering Department, permitting the move from Switzler Hall to the new quarters.

Laboratory, classroom and office space available rarely meet the needs generated by increasing student enrollment and necessity for new, modern laboratory equipment because appropriated funds have been difficult to obtain. This lack of state funding was especially critical during the depression which began in 1929 and ended about 1938.

The federal government passed legislation establishing the Public Works Administration to furnish useful work for the unemployed. President Middlebush presented several University building projects to the P.W.A., including an addition to the engineering laboratories. This project was approved, and completed in 1936 at a cost of \$157,240. This laboratory addition consisted of a three-floor annex directly west of, and connected by a corridor to, the main Engineering Building. This portion of the new building not only furnished much-needed classroom and office space on all three floors, but also furnished the necessary expansion space on the second floor for the Engineering Library which had been located in the Engineering Building's main assembly room.

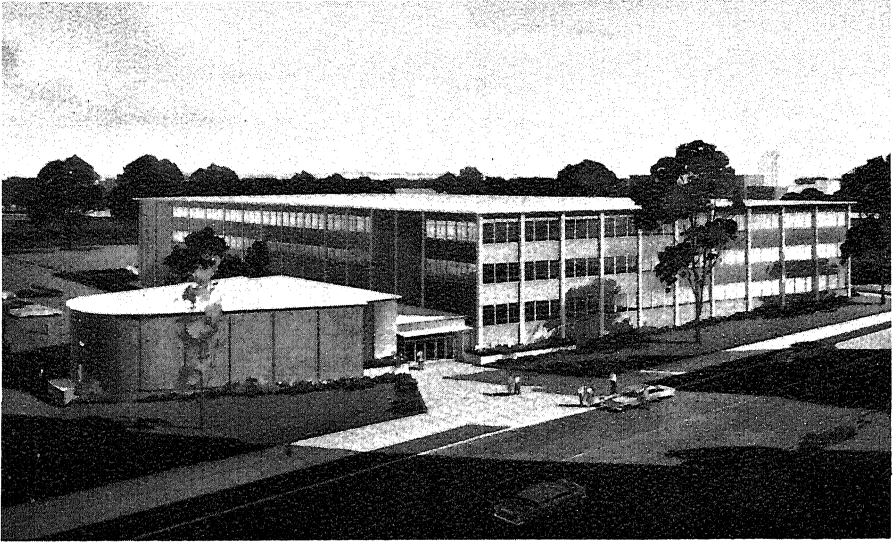
The single floor area west of the three-floor area extended from the Civil Engineering Building on the south, northwest the same distance as the Engineering Building (thus providing space on the south for the chemical engineering laboratories) and separated on the north by a partition wall from the mechanical engineering laboratory, which in turn was separated by another partition wall on the north from the electrical engineering laboratory.

Office space for an increasing faculty was at a premium, and the need for more interview rooms for graduating seniors was becoming critical. This problem was partially solved in 1951, by the construction of the Engineering Annex building, on the west at the north end of the Engineering Building. This was a single-story building containing twelve offices and costing \$40,000.

The critical need for laboratory space is shown by the fact that in 1950 a corrugated steel building occupying a ground space approximately 15' x 25' was erected immediately west of the civil engineering laboratory to accommodate several research projects in civil engineering. By 1954, the enrollment had increased to such an extent that night classes were being held in the machine tool laboratory and in engineering drawing. Courses in engineering drawing were being held in a temporary building (T-3) immediately north of Switzler Hall. These courses had formerly been held in the Engineering Building, but because of needed design rooms and offices, the engineering drawing courses were moved to Building T-3.

At that time, as a matter of fact, most state-supported institutions were becoming cramped for space and lagging behind with improvements. Consequently, it was suggested that a bond issue finance the building needs. In 1955, Governor Phil Donnelly suggested and the legislature approved a state referendum on a \$75,000,000 bond issue. The Governor then appointed a state-wide committee to support the legislation and to educate the public, with President Elmer Ellis as committee chairman. The approval by the voters was due in no small part to

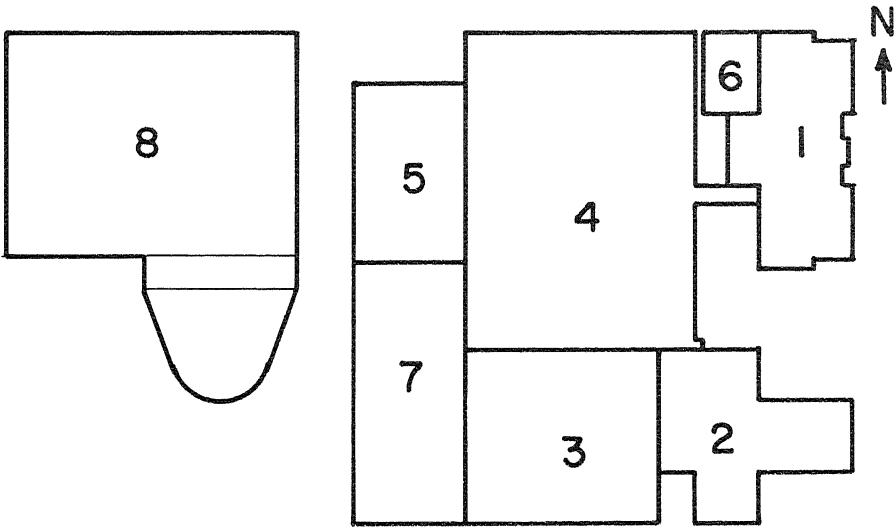
cal circuit, control systems, and electronic laboratories. It also housed the network analyzer, analog computers, and drafting rooms and offices for faculty of the Mechanical Engineering, Industrial Engineering, and Mathematics Departments. The space vacated in the Engineering Laboratories Building by moving the laboratories to the new building was occupied by the machine tool laboratory, which had been located on the ground floor of the civil engineering laboratory, and the industrial engineering laboratory, which was assigned to the west end of the vacated electrical engineering laboratory. The space vacated by moving the machine tool laboratory was absorbed by the Civil Engineering Department.



Electrical Engineering Building and Auditorium (1958)

Lathrop Hall, built prior to 1907 on the lot west of the engineering laboratories, was occupied by the Music Department and had been condemned several times before it was finally dismantled in 1958. The entire area west of the engineering laboratories to Sixth St. was then converted to University faculty parking.

It was believed, in 1959, that the new Electrical Engineering Building would satisfy the space needs of the College for about five years. The logical location for further expansion seemed to be the parking lot directly west of the engineering laboratories. With parking facilities on the ground floor and separated from the Laboratory Building by an alley, Dean Croft estimated that a building 284' x 130' would cost \$27 per sq. ft., or, \$2,400,000. Such a building would include, among other facilities, doubled space for the overcrowded Library stack and reading rooms, 10 classrooms, six design rooms, five seminar rooms, twelve faculty offices, four student offices, and a student lounge.



Development of Engineering Buildings:

- #1 Engineering Building, 145' front, 70' deep. Built 1893; cost \$30,000.
- #2 Mechanic Arts Building, 108' front, 117' deep. Built 1893, burned 1911; repaired 1929, 1922, cost \$44,500.
- #3 Engineering Laboratories (Civil Engineering), 185' x 109'. Built 1922, cost, \$47,000.
- #4 Engineering Laboratories (Chemical, Mechanical, and Electrical Laboratories), 207' x 140'. Built 1936, cost \$57,000.
- #5 Engineering Laboratories (Mechanical and Electrical Laboratories), 110' x 52'. Built 1949, cost \$338,700.
- #6 Engineering Annex (Offices), 38' x 48'. Built 1951, \$40,000.
- #7 Engineering Laboratories (Civil and Chemical Laboratories), 160' x 52'. Built 1957, cost \$504,000.
- #8 1 Electrical Engineering Building, 123' front by 190' and 300-seat auditorium, Built 1958, cost, \$1,500,000.

NOTE: A two-story brick veneer frame building, 145' x 75' called the Engineering Annex occupied the east half of the space shown as Building 4 in the above diagram. This building, occupied by the Electrical and Mechanical Engineering laboratories, design rooms and offices, was torn down in 1936 to permit construction of Building 4.



Engineering Building, looking southwest from the School of Journalism.

ROSTER OF FULL-TIME ENGINEERING FACULTY
FOR EACH YEAR
FROM 1940 to 1967.

NOTE: Degrees held at time of individual's engagement and those awarded later are shown separately; thereafter, only the highest degree is listed.

COLLEGE OF ENGINEERING
1940-41

Administration

Frederick Arnold Middlebush, PhD, LLD - President.

Harry Alfred Curtis, BSChE, MA, Colorado; PhD, Wisconsin.

Dean of Faculty, College of Engineering; Director of Engineering
Experiment Station; Professor of Chemical Engineering.

Elmer James McCaustland, BSCE, MCE.

Dean Emeritus, Director Emeritus, Professor Emeritus of Sanitary Engineering.

Agricultural Engineering

Professor: Wooley, John C., MDi, Iowa State Tchrs Coll; BSAgE, MS, Iowa
State, Chairman.

Jones, Mack Marquis, BSEE, Illinois; MS, Iowa State.

Instructor: Beasley, Robert P., BSAgE, Missouri.

Hightower, Lloyd E., BSAg; AM, Missouri.

Lytle, William F., BSCE, BSAgE, Illinois.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)

Assoc. Prof: Lorah, James R., BSChE, PhD, Univ. of Washington, Chairman.

Asst. Prof: Luebbers, Ralph H., BSChE, PhD, Iowa State.

Porter, David J., BSChE, Illinois; PhD, Pennsylvania State.

Instructor: Oldham, Frank Dudley, BS, Middle Tenn. State Coll.; MS, Ten-
nessee.

Civil Engineering

Professor: Rubey, Harry, BS, CE, Illinois, Chairman.

Assoc. Prof: LaRue, Harry A., BSCE, CE, Missouri.

Moorman, Robert B. B, BS, Illinois; PhD, Iowa State.

Wood, Horace W., Jr., BS, Engr., Missouri; MS, Michigan.

Asst. Prof: Logan, John A., B.S., BCE, Saskatchewan; MSSE, Harvard.
Instructor: Comins, Harrison D., BS, MS, Lehigh Univ.
Gillan, Gerald Keith, BSCE, Nebraska.
Holmes, William Worth, BSCE, MS, Texas A & M.
(Hyde, A. Lincoln, Professor Emeritus of Bridge Engineering,
limited service - 9/1/34 to death 4/13/49.)

Electrical Engineering

Professor: Lanier, Alexander C., BSEE, Tennessee; MSEE, Harvard, Chairman.
Weinbach, Mendell P., BSEE, AM, Missouri.
Assoc. Prof: Wallis, Clifford M., BSEE, Vermont; MSEE, M.I.T. (Sabbatical)
Asst. Prof: Vaile, Robert B., Jr., BS, PhD, Calif. Inst. Tech.
Instructor: Waidelich, Donald L., BSEE, MS, Lehigh Univ.

Mechanical Engineering

Professor: Phillips, Ernest Churchill, AB, Central College; ME, Missouri.
Selvidge, Robert W., BS, MA, Columbia Univ. (Industrial Educ.)
Assoc. Prof: Scoriah, Ralph L., BS, Purdue; PhD, Illinois, Chairman.
Gray, Ellsworth, SBME, M.I.T.; MS, Purdue.
Wharton, James R., BSME, ME, Missouri.
Asst. Prof: Elliott, Walter R., BS, Saskatchewan; MSME Minnesota.
Sogard, Ralph H., BS, ME, Wisconsin. (Also Suprv. Power Plant)
Instructor: Bolstad, Milo M., BSME, Minnesota; SMME, Mass. Inst. Tech.
Fitzhugh, Thomas C., AB, Texas A & M. (Engr. Drawing)
McAnulty, James C., SBME, Mass. Inst. Tech.
Miller, Walter H., BS, Education, AM, Missouri.
Holcomb, Calvin W., BSCE, Oklahoma. (On leave)

COLLEGE OF ENGINEERING 1941-42

Administration

Frederick Arnold Middlebush, PhD, LLD - President.
Harry Alfred Curtis, PhD.
Dean of Faculty, College of Engineering; Director of Engineering Experiment
Station; Professor of Chemical Engineering.
Elmer James McCaustland, MCE. (Deceased May 16, 1941)
Dean Emeritus, Director Emeritus, Professor Emeritus of Sanitary Engineering.

Agricultural Engineering

Professor: Wooley, John C., MS, Chairman.
Jones, Mack Marquis, MS.

Instructor: Beasley, Robert P., AM, Missouri.
Hightower, Lloyd E., AM. (On leave)
Lytle, William F., BSAgE.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)
Assoc. Prof: Lorah, James R., PhD, Chairman
Asst. Prof: Luebbers, Ralph H., PhD. (On leave)
Porter, David J., PhD.
Instructor: Oldham, Frank Dudley, MS.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman
(Lv. absence from regular University teaching 6/15/42 until further notice. Director in Charge E.S.M.W.T. and Naval Diesel School, also in charge Engr. Science & Management Training Program.)
Assoc. Prof: Larue, Harry A., CE.
Moorman, Robert B. B., PhD.
Winterkorn, Hans F., Res. Assoc. Prof., Soils Mechanics, PhD, Heidelberg.
Wood, Horace W., Jr., MS.
Asst. Prof: Logan, John A., MSSE.
Instructor: Comins, Harrison D., MS.
Gillan, Gerald Keith, BSCE.
Simpson, William M., BSCE, Okla., MSCE, Texas A. & M.

Electrical Engineering

Professor: Lanier, Alexander C., MEE (Deceased 2/26/42)
Weinbach, Mendell P., AM.
Assoc. Prof: Wallis, Clifford M., DSc, Harvard.
Asst. Prof: Vaile, Robert B., Jr., PhD. (On leave)
Instructor: Tillotson, Leroy G., BSEE, Idaho; MSEE, Missouri.
Waidelich, Donald L., MS.

Mechanical Engineering

Professor: Phillips, Ernest C., ME.
Selvidge, Robert W., MA. (Industrial Ed.) (Deceased 11/16/41)
Assoc. Prof: Scorah, Ralph L., PhD, Chairman.
Gray, Ellsworth S., MS.
Wharton, James R., ME.
Asst. Prof: Burr, Arthur H., BSME, Pittsburgh.
Elliott, Walter R., PhD, Purdue.
Sogard, Ralph H., MS.

Instructor: Bolstad, Milo M., SMME.
Fitzhugh, Thomas C., Jr., AB. (On leave)
Holcomb, Calvin W., BSCE.
McAnulty, James C., BSME.
Miller, Walter H., AM.

COLLEGE OF ENGINEERING 1942-43

Administration

Frederick Arnold Middlebush, PhD, LLD - President.

Harry Alfred Curtis, PhD.

Dean of Faculty, College of Engineering; Director of Engineering
Experiment Station; Professor of Chemical Engineering.

Agricultural Engineering

Professor: Wooley, John C., MS, Chairman.
Jones, Mack Marquis, MS.

Instructor: Beasley, Robert P., AM. (L/A 1/1/43 - 8/31/43 in Navy)
Hightower, Lloyd E., AM.
Lytle, William F., BSAG.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)

Assoc. Prof: Lorah, James R. PhD, Chairman.

Asst. Prof: Luebbers, Ralph H., PhD. (On leave)
Porter, David J., PhD.

Instructor: Oldham, Frank D., MS.

Civil Engineering

Professor: Wood, Horace W., Jr., MS, Acting Chairman.

Rubey, Harry, CE. (See note 1941-42)

Assoc. Prof: LaRue, Harry A., CE.

Moorman, Robert B. B., PhD. (L/A effective 1/8/43)

Winterkorn, Hans F., PhD. (Resigned 8/31/43)

Asst. Prof: Comins, Harrison D., MS. (L/A 3/15/43 - 8/31/43)

Instructor: Gillan, Gerald Keith, MSCE, Missouri. (L/A 2/6-8/31/43)

Simpson, William McCray, PhD, Ill. Inst. Tech. (Resigned 8/31/43)

Tate, Manford Bent, BSCE, MS, Missouri.

Electrical Engineering

Professor: Weinbach, Mendell P., AM, Chairman.
Assoc. Prof: Wallis, Clifford M., DSc.
Asst. Prof: Lamb, John F., BSEE, Carnegie Tech.; MSEE, ScD, Michigan.
Vaile, Robert P., Jr., PhD. (On leave)
Waidelich, Donald L., MS.

Mechanical Engineering

Professor: Phillips, Ernest C., ME
Scorah, Ralph L., PhD, Chairman.
Assoc. Prof: Gray, Ellsworth S., MS.
Wharton, James R., ME.
Asst. Prof: Bolstad, Milo M., SMME.
Burr, Athur H., MSME.
Elliott, Walter R., PhD.
Instructor: Holcomb, Calvin W., BSCE.
McAnulty, James C., SBME.
Miller, Walter H., AM.
Allen, Robert, Engr. Science & Mgmt. Training Program.

COLLEGE OF ENGINEERING

1943-44

Administration

Frederick Arnold Middlebush, PhD, LLD - President.
Harry Alfred Curtis, PhD.
Dean of Faculty, College of Engineering; Director of Engineering
Experiment Station; Professor of Chemical Engineering.

Agricultural Engineering

Professor: Wooley, John C., MS, Chairman.
Jones, Mack Marquis, MS.
Instructor: Beasley, Robert P., AM.
Hightower, Lloyd E., AM.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)
Assoc. Prof: Lorah, James R., PhD, Chairman.
Asst. Prof: Luebbers, Ralph H., PhD. (On leave Res. Officer in Sanitary Corps.)
Oldham, Frank D., MS.
Porter, David J., PhD. (On leave)
Instructor: Heinze, Robert Christian, BSChE, Missouri. (L/A 4/1/44 - 8/31/44)

Civil Engineering

- Professor: Rubey, Harry, CE. (See note 1941-42)
Moorman, Robert B. B., PhD. (On leave)
Wood, Horace W., Jr., MS.
- Assoc. Prof: LaRue, Harry A., CE.
- Asst. Prof: Comins, Harrison D., MS. (On leave)
- Instructor: Gillan, Gerald Keith, MS. (On leave)
New, John Calhoun, BSCE, Missouri.
Tate, Manford Bent, MS.

Electrical Engineering

- Professor: Weinbach, Mendell P., AM, Chairman.
- Assoc. Prof: Wallis, Clifford M., DSc.
- Asst. Prof: Lamb, John Frazier, ScD.
Vaile, Robert P., Jr., PhD. (On leave)
Waidelich, Donald L., MS.
- Instructor: Harris, Hollis Ward, BSEE, New Mexico, New Mexico A &M.

Mechanical Engineering

- Professor: Phillips, Ernest C., ME.
Scorah, Ralph L., PhD, Chairman.
- Assoc. Prof: Gray, Ellsworth S., MSME. (Resigned 8/31/44)
Wharton, James R., ME.
- Asst. Prof: Bolstad, Milo M., SMME.
Burr, Arthur H., MSME. (L/A 4/1/44 - 8/31/44)
Elliott, Walter R., PhD. (L/A 4/1/44 - 8/31/44)
Miller, Walter H., AM.
- Instructor: McAnulty, James C., SBME.

Baender, Frederick G., Assoc. Prof. of Mechanical Engrg,
Special Course for Veterans ASTP.

COLLEGE OF ENGINEERING 1944-45

Administration

- Frederick Arnold Middlebush, PhD, LLD - President.
Harry Alfred Curtis, PhD.
Dean of Faculty, College of Engineering; Director of Engineering
Experiment Station; Professor of Chemical Engineering. (L/A 4/24/45 -
9/30/45)

Agricultural Engineering

- Professor: Wooley, John C., MSAgE, Chairman.
Jones, Mack M., MS.

Instructor: Beasley, Robert P., AM. (On leave)
Hightower, Lloyd E., AM.
Steinbruegge, George William, BSAgE, Missouri.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)
Assoc. Prof: Lorah, James R., PhD, Chairman.
Asst. Prof: Luebbers, Ralph H., PhD. (On leave - Reserve Officers Sanitary Corps.)
Oldham, Frank D., PhD, Missouri. (On leave)
Porter, David J., PhD. (On leave)
Instructor: Heinze, Robert Christian, BSChE.

Civil Engineering:

Professor: Rubey, Harry, CE., Chairman - Acting Dean & Director Engr. Exp. Station (4/24/45 - 8/31/45).
Moorman, Robert B. B., PhD. (On leave)
Wood, Horace W., Jr., MS.
Assoc. Prof: LaRue, Harry A., CE.
Asst. Prof: Comins, Harrison D., MS. (On leave)
Jones, Eugene Garry, BSCE, Missouri. (1/10/44 - 4/10/44 A.S.T. Engr. Program)
Instructor: Gillian, Gerald Keith, MSCE. (On leave)
New, John Calhoun, BSCE. (On leave)
Tate, Manford Bent. MS.

Electrical Engineering

Professor: Weinbach, Mendell P., AM, Chairman.
Assoc. Prof: Wallis, Clifford M., DSc. (On leave)
Asst. Prof: Lamb, John F., ScD.
Vaile, Robert P. Jr., PhD. (On leave)
Waidelich, Donald L., MSEE.

Mechanical Engineering

Professor: Scolah, Ralph L., PhD, Chairman.
Phillips, Ernest C., ME.
Assoc. Prof: Burr, Arthur H., MSME (On leave)
Wharton, James R., ME. (Deceased 10/21/44)
Asst. Prof: Bolstad, Milo M., SMME (On leave)
Elliott, Walter R., PhD.
Miller, Walter H., AM.
Instructor: Holcomb, Calvin W., BSCE.
McAnulty, James C., SBME.

COLLEGE OF ENGINEERING
1945-46

Administration

Frederick Arnold Middlebush, PhD, LLD - President.

Harry Alfred Curtis, PhD.

Dean of Faculty, College of Engineering, Director of Engineering Experiment Station; Professor of Chemical Engineering.

Agricultural Engineering

Professor: Wooley, John C., MSAgE, Chairman.

Jones, Mack M., MS.

Instructor: Beasley, Robert P., AM.

Hightower, Lloyd, AM. (Resigned 1/31/46)

Steinbruegge, George William, BSAgE, Missouri.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)

Assoc. Prof: Lorah, James R., PhD, Chairman.

Luebbers, Ralph H., PhD. (L/A terminating 1/1/46)

Asst. Prof: Oldham, Frank D., PhD.

Instructor: Heinze, Robert Christian, BSChE.

Civil Engineering

Professor: Rubey, Harry, CE., Chairman.

Moorman, Robert B. B., PhD.

Wood, Horace W., Jr., MS.

Assoc. Prof: LaRue, Harry A., CE.

Asst. Prof: Comins, Harrison D., MS. (On leave)

Tate, Manford Bent, MSCE.

Instructor: Gillian, Gerald Keith, MSCE (On leave)

New, John Calhoun, BSCE. (On leave)

Electrical Engineering

Professor: Weinbach, Mendell P., AM, Chairman.

Wallis, Clifford M., DSc.

Williams, Walter Scott (Emeritus - effective 1939).

Asst. Prof: Lamb, John F., ScD.

Waidelich, Donald L., MS. (Sabbatical leave)

Mechanical Engineering

Professor: Scolah, Ralph L., PhD, Chairman.

Phillips, Ernest C., M.E.

Assoc. Prof: Burr, Arthur H., MSME. (On leave)

Smith, Eastman, SB Harvard Col. War Certf., ScD, Mass. Inst. Tech.

Asst. Prof: Bolstad, Milo M., SMME.

McAnulty, James C., SBME. (On leave)

Miller, Walter H., AM.

Instructor: Holcomb, Calvin W., BSCE.

COLLEGE OF ENGINEERING

1946-47

Administration

Frederick Arnold Middlebush, PhD, LLD - President.

Harry Alfred Curtis, PhD.

Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Chemical Engineering.

Agricultural Engineering

Professor: Wooley, John C., MSAgE, Chairman.

Jones, Mack M., MS.

Asst. Prof: Beasley, Robert P., AM.

Instructor: Day, Cecil LeRoy, BSAgE, Missouri.

Steinbruegge, George William, BSAgE.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)

Assoc. Prof: Lorah, James R., PhD, Chairman.

Luebbers, Ralph H., PhD.

Oldham, Frank D., PhD.

Instructor: Heinze, Robert C., BSCHE.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman.

Moorman, Robert B.B., PhD.

Wood, Horace W., Jr., MS.

Assoc. Prof: LaRue, Harry A., CE.

Murphy, Lindon J., BSCE, MSCE, PCE, Iowa State.

Asst. Prof: Comins, Harrison D., MS. (On leave)

Gillan, Gerald Keith, MSCE.

Joseph, Joseph, Albert, MS.

Tate, Manford Bent, MSCE (On leave)

Electrical Engineering

Professor: Weinbach, Mendell P., AM, Chairman (Deceased 3/29/47.)

Wallis, Clifford M., DSc.

Assoc. Prof: Waidelich, Donald L., PhD., Iowa State.

Asst. Prof: Lamb, John F., ScD.

Mechanical Engineering

Professor: Scolah, Ralph L., PhD., Chairman.

Phillips, Ernest C., ME.

Assoc. Prof: Smith, Eastman, ScD.

Asst. Prof: Bolstad, Milo M., SMME. (On leave)

Holcomb, Calvin W., BSCE.

Miller, Walter H., AM.

Ogden, Paul, BSME, Missouri.

COLLEGE OF ENGINEERING

1947-48

Administration

Frederick Arnold Middlebush, PhD., LLD - President.

Harry Alfred Curtis, PhD.

Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Chemical Engineering.

Agricultural Engineering

Professor: Wooley, John C., MS, Chairman.
Jones, Mack M., MS.

Asst. Prof: Beasley, Robert P., AM.
Day, C. LeRoy, MSAgE, Missouri.
McKibben, James S., BSAgE.
Steinbruegge, George W., BSAgE.

Chemical Engineering

Professor: Curtis, Harry A. (See Administration)

Assoc. Prof: Lorah, James R., PhD, Chairman.
Luebbbers, Ralph H., PhD.
Oldham, Frank D., PhD.

Asst. Prof: Heinze, Robert C., BSChE.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman.
Moorman, Robert B.B., PhD.
Wood, Horace W., Jr., MS.

Assoc. Prof: LaRue, Harry A., CE.
Murphy, Lindon J., PCE.

Asst. Prof: Evans, Karl Held, BSCE, MSCE, Illinois.
Gillan, Gerald Keith, MSCE.
Joseph, Joseph Albert, MS.
Tate, Manford Bent, MSCE.

Electrical Engineering

Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD.

Asst. Prof: Lago, Gladwyn V., BS, Okla., MSE, Purdue.
Lamb, John F., ScD.
Seneff, Harold Lockwood, Jr., MSEE.

Instructor: Gastineau, Bert J. (eff. 2/1/48), BSEE, Missouri.
Hogan, Joseph C., BSEE, Washington Univ.

Mechanical Engineering

Professor: Scolah, Ralph L., PhD, Chairman.
Phillips, Ernest C., ME. - Emeritus.

- Assoc. Prof: Bolstad, Milo M., SMME.
Smith, Eastman, ScD.
- Asst. Prof: Dayton, Robert Weller, MS. (Resigned 8/31/48)
Holcomb, Calvin W., BSCE.
Kimbrell, Jack T., MSME.
Miller, Walter H., AM.
Ogden, Paul, BSME.
- Instructor: Hall, Donald E.

COLLEGE OF ENGINEERING 1948-49

Administration

- Frederick Arnold Middlebush, PhD, LLD - President.
Harry Alfred Curtis, PhD.

Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Chemical Engineering. (Resigned 2/16/49)

- Harry Rubey, CE, Acting Dean and Acting Director; Professor of Civil Engineering - Effective 2/17/49.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Wooley, J. C., MS. (half-time)
- Asst. Prof: Beasley, Robert P., AM.
Day, C. LeRoy, MSAgE.
Hall, Herman J., BSAgE.
Steinbruegge, George W., BSAgE.
- Instructor: McKibben, James S., BSAgE.

Chemical Engineering

- Professor: Curtis, Harry A. - Resigned 2/16/49. (See Administration)
Luebbers, Ralph H., PhD.
Oldham, Frank Dudley, PhD.
- Assoc. Prof: Lorah, James R., PhD, Chairman
- Asst. Prof: Heinze, Robert C., BSChE.
Mellow, Ernest W., PhD. (Eff. 2/1/49)

Civil Engineering

- Professor: Rubey, Harry, CE, Chairman (See Administration)
Moorman, Robert B.B., PhD.
Wood, Horace W., Jr., MS.
- Assoc. Prof: LaRue, Harry A., CE.
Murphy, Lindon J., PCE.
- Asst. Prof: Evans, Karl Held, MSCE.
Gillan, Gerald Keith, MSCE.
Stinson, Spencer Davis, BS.
Tate, Manford Bent, MSCE.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., Ph.D.
- Assoc. Prof: Lamb, John F., ScD.
- Asst. Prof: Gastineau, Bert J., MSEE, Missouri
Lago, Gladwyn V., MSE.
Seneff, Harold Lockwood, Jr., MSEE.
Vredenburgh, Edward J., BSEE, MSEE, Missouri.
- Instructor: Govro, Marvin A., BS, Washington Univ.
Hausenbauer, Charles R., BSEE, MSEE, Missouri.
Hogan, Joseph Charles, MSEE, Missouri.

Mechanical Engineering

- Professor: Scolah, Ralph L., PhD, Chairman
- Assoc. Prof: Bolstad, Milo M., SMME.
Smith, Eastman, ScD.
- Asst. Prof: Holcomb, Calvin W., BSCE.
Kimbrell, Jack T., MSME.
Miller, Walter H., AM.
Ogden, Paul, BSME.
- Instructor: Francis, Lyman Leslie, BSME, Missouri.

COLLEGE OF ENGINEERING 1949-50

Administration

- Frederick A. Middlebush, PhD, LL.D. - President.
- Huber Ogilvie Croft, BSME, Colo.; MSME, Ill.
Dean of Faculty, College of Engineering; Director of Engineering Experiment
Station; Professor of Mechanical Engineering.
- Walter H. Miller, BS, Education, AM, Missouri, Assistant to Dean. (Eff 2/1/50)

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Wooley, J. C., MS. (half-time)
- Asst. Prof: Beasley, Robert P., AM.
Day, C. LeRoy, MS.
- Instructor: Brooker, Donald R., BSAgE, MS, Missouri.
Butler, Beverly J.
McKibben, James S., BSAgE.

Chemical Engineering

- Professor: Oldham, Frank D., PhD, Chairman.
Luebbbers, Ralph H., PhD.
- Assoc. Prof: Lorah, James R., PhD.
- Asst. Prof: Heinze, Robert C., BSChE.
Mellow, Ernest W., PhD.

Civil Engineering

- Professor: Rubey, Harry, CE. Chairman
Moorman, Robert B. B., PhD.
Murphy, Lindon J., PCE.
Wood, Horace W., Jr.
- Assoc. Prof: LaRue, Harry A., CE.
- Asst. Prof: Evans, Karl Held, MSCE.
Gillan, Gerald Keith, PhD, Missouri.
Sangster, William McCoy, BSCE, MS, Iowa.
Stinson, Spencer Davis, BS.
Tate, Manford Bent, MSCE.

Electrical Engineering

- Professor: Wallis, Clifford M., MSc, Chairman.
Waidelich, Donald L., PhD.
- Assoc. Prof: Lamb, John F., ScD.
- Asst. Prof: Gastineau, Bert J., MSEE.
Hogan, Joseph C., MSEE.
Lago, Gladwyn V., MSE.
Seneff, Harold Lockwood, Jr., MSEE.
Vredenburg, Erward J., MSEE.
- Instructor: Govro, Marvin A., BS.

Mechanical Engineering

- Professor: Scolah, Ralph L., PhD, Chairman.
Croft, Huber O., MS (See Administration)
- Assoc. Prof: Bolstad, Milo M., PhD, Minnesota.
Smith, Eastman, ScD.
- Asst. Prof: Hall, Donald E., MSME.
Holcomb, Calvin W., BSCE.
Miller, Walter H., AM. (See Administration)
Ogden, Paul, BSME, Missouri.
- Instructor: Francis, Lyman Leslie, BSME, MS, Missouri.

COLLEGE OF ENGINEERING 1950-51

Administration:

- Frederick A. Middlebush, PhD, LLD - President.
- Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
- Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Wooley, J. C., MS. (half-time)
- Asst. Prof: Beasley, Robert P., AM.
Day, C. LeRoy, MS.
- Instructor: Butler, Beverly J.
McKibben, James S., BSAgE.
Stewart, Robert E., BSAgE, MS, Missouri.
Reaves, Carl A.

Chemical Engineering

- Professor: Oldham, Frank D., PhD, Chairman.
Luebbbers, Ralph H., PhD.
- Assoc. Prof: Lorah, James R., PhD.
- Asst. Prof: Heinze, Robert C., BSChE. (Resigned 8/31/51)
Mellow, Ernest W., PhD.

Civil Engineering

- Professor: Rubey, Harry, CE, Chairman.
Moorman, Robert B. B., PhD.
Wood, Horace W. Wood, Jr., MS.
- Assoc. Prof: Gillan, Gerald Keith, MSCE.
LaRue, Harry A., CE.
Tate, Manford Bent, MSCE.
- Asst. Prof: Evans, Karl Held, MSCE.
Sangster, William M., MSCE.
Stinson, Spencer Davis, BS.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD.
- Assoc. Prof: Lamb, John F., ScD.
- Asst. Prof: Gastineau, Bert J., MSEE.
Hogan, Joseph C., MSEE.
Lago, Gladwyn V., MSE.
Seneff, Harold Lockwood, Jr., MSEE.
Vredenburgh, Edward J., MSEE.
- Instructor: Dixon, John Douglas, BSEE, Minnesota.
Govro, Marvin A., BS.

Mechanical Engineering

- Professor: Scolah, Ralph L., PhD., Chairman
Croft, Huber O., MS. (See Administration)
- Assoc. Prof: Bolstad, Milo M., PhD.
Ogden, Paul, MSME, Missouri.
Smith, Eastman, ScD.

- Asst. Prof: Farquharson, Kenneth J., BSME, Mo.
 Hall, Donald E., MSME.
 Holcomb, Calvin W., BSCE.
 Kimbrell, Jack T., MSME.
 Miller, Walter H., AM. (See Administration)
 Pringle, Oran A., BSME, Kans.; MSME, Wisc.
 Sneed, Carl M., Jr., BSME, Mo.; MS, Stevens Inst.
 Walker, Robert E., BS Ed., AM.
- Instructor: Francis, Lyman Leslie, MSME.

COLLEGE OF ENGINEERING 1951-52

Administration

- Frederick A. Middlebush, PhD, LLD - President.
 Huber O. Croft, MS.
 Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
 Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
 Wooley, J. C., MS. (half-time)
- Assoc. Prof: Beasley, Robert P., AM.
 Esmay, Merle L., MS, Iowa State.
- Asst. Prof: Brooker, Donald R., MSAgE.
 Day, C. LeRoy, MS.
 Williams, Herman F., MS.
- Instructor: McKibben, James S., MSAgE, Missouri.
 Stewart, Robert E., MS.

Chemical Engineering

- Professor: Oldham, Frank D., PhD, Chairman.
 Luebbbers, Ralph H., PhD.
- Assoc. Prof: Lorah, James R., PhD.
- Asst. Prof: Mellow, Ernest W., PhD. (Resigned 8/31/52)
- Instructor: Crosser, Orin K., BSChE, MS, Missouri.

Civil Engineering

- Professor: Rubey, Harry, CE, Chairman.
 Moorman, Robert B. B., PhD. (Resigned 8/31/52)
 Murphy, Lindon J., PCE.
 Wood, Horace W., Jr., MS.
- Assoc. Prof: Evans, Karl Held, MSCE.
 Gillan, Gerald Keith, MSCE. (Resigned 8/31/52)
 LaRue, Harry A., CE.
 Tate, Manford Bent, MSCE.
 Wetterstrom, Edwin, PhD. (Effective 2/1/52)

Asst. Prof: Sangster, William M., MSCE.
Instructor: Fistedis, Stan H., PhD, Missouri.

Electrical Engineering

Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD. (On leave)
Assoc. Prof: Lamb, John F., ScD.
Asst. Prof: Gastineau, Bert J., MSEE. (Resigned 8/31/52)
Govro, Marvin A., MSEE. (Resigned 8/31/52)
Hogan, Joseph C., MSEE. (On leave)
Lago, Gladwyn V., MSE.
Seneff, Harold L., Jr., MSEE. (Resigned 8/31/52)
Vredenburgh, Edward J., MSEE.
Instructor: Dixon, John D., MSEE, Missouri.

Mechanical Engineering

Professor: Scolah, Ralph L., PhD., Chairman.
Croft, Huber O., MS. (See Administration)
Assoc. Prof: Smith, Eastman, ScD.
Asst. Prof: Farquharson, Kenneth J., MSME.
Francis, Lyman L., MS. (Resigned 8/31/52)
Miller, Walter H., AM (See Administration)
Pringle, Oran A., MSME.
Walker, Robert E., AM. (Resigned 1/31/52)
Instructor: Love, John, Jr., AB, BSME, Missouri.
Thorne, Joseph R.

COLLEGE OF ENGINEERING 1952-53

Administration

Frederick A. Middlebush, PhD, LLD - President.
Huber O. Croft, MS.

Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.

Walter H. Miller, AM Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

Professor: Jones, Mack M., MS, Chairman.
Wooley, J. C., MS. (half-time)
Assoc. Prof: Beasley, Robert P., AM.
Esmay, Merle Linden, PhD.
Asst. Prof: Brooker, Donald R., MSAgE.
Day, C. Leroy, MS.
Williams, Herman F., MS.
Instructor: McKibben, James S., MSAgE.
Stewart, Robert E., MS.

Chemical Engineering

Professor: Oldham, Frank D., PhD, Chairman
Luebbers, Ralph H., PhD.
Assoc. Prof: Lorah, James R., PhD.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman.
Murphy, Lindon J., PCE.
Wood, Horace W., Jr., MS.
Assoc. Prof: Evans, Karl Held, MSCE.
LaRue, Harry A., CE.
Asst. Prof: King, Thomas A., MSCE.
Sangster, William M., MSCE.
Wetterstrom, Edwin, PhD.

Electrical Engineering

Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD.
Assoc. Prof: Lamb, John F., ScD.
Asst. Prof: Dixon, John D., MSEE, Missouri.
Hogan, Joseph C., MSEE.
Lago, Gladwyn V., MSE.
Tudor, James R., BSEE, MSEE, Missouri.
Vredenburgh, Edward J., MSEE.

Mechanical Engineering

Professor: Scolah, Ralph L., PhD., Chairman.
Croft, Huber O., MS. (See Administration)
Assoc. Prof: Bolstad, Milo M., PhD, Minnesota.
Smith, Eastman, ScD.
Asst. Prof: Elliott, George W., BSIE, Iowa.
Francis, Lyman L, MS.
Miller, Walter H., AM. (See Administration)
Pringle, Oran A., MSME.
Sneed, Carl M., MSME.
Instructor: Love, John, Jr., BSME.
Moore, Gordon L., BSME, Missouri.

COLLEGE OF ENGINEERING 1953-54

Administration

Frederick A. Middlebush, PhD, LLD - President.
Huber O. Croft, MS.
Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.

Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

Professor: Jones, Mack M., MS, Chairman.
Esmay, Merle Linden, PhD.
Wooley, J. C., MS (Emeritus 9/1/53)

Assoc. Prof: Beasley, Robert P., AM.
Stewart, Robert Edwin, PhD, Missouri. (Chgd. to Prof. 12/1/53)

Asst. Prof: Brooker, Donald Brown, MSAgE.
Day, C. LeRoy, MS.
McKibben, James S., MSAgE.

Chemical Engineering

Professor: Oldham, Frank D., PhD, Chairman.
Luebbers, Ralph H., PhD.

Assoc. Prof: Lorah, James R., PhD.

Asst. Prof: de Chazal, L. E. Marc, BSChE, MSChE, La.; PhD, Okla. State.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman.
Murphy, Lindon J., PCE. (L/A)
Wood, Horace W., Jr., MS.

Assoc. Prof: Evans, Karl Held, MSCE.
LaRue, Harry A., CE.
Pauw, Adrian, BSCE, Wash.; MS, PhD, Cal Tech.

Asst. Prof: Sangster, William M., MSCE.
Wetterstrom, Edwin, PhD.

Electrical Engineering

Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD.

Assoc. Prof: Hogan, Joseph C., PhD, Wisconsin.
Lamb, John F., PhD.

Asst. Prof: Lago, Gladwyn V., MSE (Sabbatical leave)
Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE.

Mechanical Engineering

Professor: Scorah, Ralph L., PhD, Chairman.
Croft, Huber O., MSME. (See Administration)
Phillips, Ernest C., ME. (Emeritus)

Assoc. Prof: Bolstad, Milo M., PhD.
Henriksen, Erik K., MSME.
Smith, Eastman, ScD.

Asst. Prof: Elliott, George Whitting, MS.
Love, John, Jr., MSME, Missouri.
Miller, Walter H., AM. (See Administration)

Pringle, Oran A., MSME.
Sneed, Carl M., MS.
Instructor: Moore, Gordon L., MSME, Missouri.

COLLEGE OF ENGINEERING 1954-55

Administration

Frederick A. Middlebush, PhD, LLD, President (resigned July 1, 1954).
President Emeritus; Professor of Political Science;
Director, University Development Fund (effective September 9, 1954).
Elmer Ellis, PhD, LLD, Acting President; Professor of History, 9/10/54).
Appointed *President, University of Missouri*, April 16, 1955.
Huber O. Croft, MS, Dean of Faculty, College of Engineering, Director of Engineering Experiment Station Professor of Mechanical Engineering.
Donald L. Waidelich, PhD, Associate Director of Engineering Experiment Station;
Professor of Electrical Engineering.
Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

Professor: Jones, Mack M., MS, Chairman.
Esmay, Merle Linden, PhD.
Stewart, Robert Edwin, PhD.
Assoc. Prof: Beasley, Robert P., AM.
Brooker, Donald Brown, MSAgE.
Day, C. LeRoy, MS.
Asst. Prof: McKibben, James S., MSAgE.

Chemical Engineering

Professor: Oldham, Frank Dudley, PhD, Chairman. (Deceased 6/17/55)
Luebbers, Ralph H., PhD.
Assoc. Prof: Lorah, James R., PhD.
Asst. Prof: de Chazal, L. E. Marc, PhD.

Civil Engineering

Professor: Rubey, Harry, CE, Chairman.
Murphy, Lindon J., PCE.
Wood, Horace W., Jr., MS.
Assoc. Prof: Evans, Karl Held, MSCE.
Pauw, Adrian, PhD.
Asst. Prof: Howard, Leonard LeRoy, MSCE (Resigned 8/31/55)
Irby, Howard Edgar, BSCE, Okla.; MSCE, Yale.
Wetterstrom, Edwin, PhD. (Resigned 8/31/55)
Petersen, Jack S., MS.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD. (See Administration)
- Assoc. Prof: Hogan, Joseph Charles, PhD.
Lago, Gladwyn V., PhD, Purdue.
Lamb, John Frazer, ScD.
- Asst. Prof: Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE.
- Instructor: Braidwood, Don W. (Resigned 8/31/55)

Mechanical Engineering

- Professor: Scolah, Ralph L., PhD, Chairman.
Croft, Huber O., MSME. (See Administration)
Phillips, Ernest C., ME. (Emeritus)
- Assoc. Prof: Bolstad, Milo M., PhD.
Henriksen, Erik K., MSME.
Smith, Eastman, ScD.
- Asst. Prof: Burton, Ralph A., PhD.
Elliott, George W., MS. (Resigned 8/31/55)
Love, John, Jr., MSME.
Miller, Walter H., AM. (See Administration)
Moore, Gordon L., MS.
Pringle, Oran Allen, MSME.
Sneed, Carl Miller, MS.

COLLEGE OF ENGINEERING 1955-56

Administration

- Elmer Ellis, PhD, LLD, President.
- Frederick A. Middlebush, PhD, LLD, President Emeritus; Director University Development Fund; Professor of Political Science.
- Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
- Donald L. Waidelich, PhD, Associate Director of Engineering Experiment Station; Professor of Electrical Engineering.
- Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Esmay, Merle Linden, PhD.
Stewart, Robert Edwin, PhD.
- Assoc. Prof: Beasley, Robert P., AM.
Brooker, Donald Brown, MSAGe.
Day, C. LeRoy, MS.
- Asst. Prof: McKibben, James C., MSAGe.
- Instructor: Curry, R. Bruce

Chemical Engineering

- Professor: Beyer, Gerhard H., BSChE, MSChE, PhD, Wisconsin.
Luebbbers, Ralph H., PhD.
Assoc. Prof: Lorah, James R., PhD.
Asst. Prof: de Chazal, L. E. Marc, PhD.

Civil Engineering

- Professor: Rubey, Harry, CE, Chairman.
Pauw, Adrian, PhD.
Wood, Horace W., Jr., MS.
Assoc. Prof: Evans, Karl Held, MSCE.
Sami, Sabri, PhD.
Asst. Prof: Irby, Howard Edgar, MSCE.
Peterson, Jack S., MS.
Wu, Tze Sun

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD. (See Administration)
Assoc. Prof: Hogan, Joseph Charles, PhD.
Lago, Gladwyn Vaile, PhD.
Lamb, John Frazer, PhD.
Asst. Prof: Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE.
Instructor: Calabrese, Carmelo, BSEE, Missouri.

Mechanical Engineering

- Professor: Scorah, Ralph L., PhD, Chairman.
Bolstad, Milo M., PhD.
Croft, Huber O., MS. (See Administration)
Eastman, Robert M., AB, Antioch; MSIE, Ohio State; PhD, Penn.
State.
Phillips, Ernest C., ME. (Emeritus)
Assoc. Prof: Beach, Harry L., BSME, Worcester Poly.; BS Ed., Yale; MS Ed.,
Conn.
Henricksen, Erik K., MSME. (Resigned 8/31/56)
Smith, Eastman, ScD.
Asst. Prof: Burton, Ralph A., PhD.
Gibson, Donald L., BSME, MSME, Iowa State.
Miller, Walter H., AM. (See Administration)
Moore, Gordon L., MS.
Pringle, Oran Allen, MSME.
Sneed, Carl Miller, MS.
Instructor: Brooks, Phillip E. J., BS, Neb. State Tchrs.; Med., Illinois.
Brown, Robert D., BSME, Purdue.

COLLEGE OF ENGINEERING

1956-57

Administration

Elmer Ellis, PhD, LLD, President.

Frederick A. Middebush, PhD, LLD, President Emeritus; Director University Development Fund; Professor of Political Science.

Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.

Donald L. Waidelich, PhD, Associate Director of Engineering Experiment Station; Professor of Electrical Engineering.

Walter H. Miller, AM, Assistant to Dean; Assistant Professor of Mechanical Engineering.

Agricultural Engineering

Professor: Jones, Mack M., MS, Chairman.

Beasley, Robert P., AM.

Stewart, Robert Edwin, PhD.

Assoc. Prof: Day, Cecil LeRoy, PhD, Iowa State.

Hodges, Teddy Omar, BSAgE, Texas A & M; MSAgE, Iowa State.

Asst. Prof: Cromwell, Charles F., Jr., BSEng., Calif.

McFate, Kenneth L., BSAgE, Iowa State.

McKibben, James S., MSAgE.

Instructor: Curry, R. Bruce, BSAgE, Kansas State; MS, Irrig. Eng., Colo. A & M.

Shanklin, Milton D., BSAgE, MSAgE, Missouri.

Chemical Engineering

Professor: Beyer, Gerhard H., PhD, Chairman.

Luebbers, Ralph H., PhD.

Assoc. Prof: Lorah, James R., PhD.

Asst. Prof: de Chazal, L. E. Marc, PhD.

Civil Engineering

Professor: Wood, Horace W., Jr., MS, Chairman.

Murphy, Lindon J., PCE.

Pauw, Adrian, PhD.

Rubey, Harry, CE. (Professor Emeritus half time.)

Assoc. Prof: Evans, Karl Held, MSCE.

Harris, Mark P., BSCE, Va. Polytech; MSCE, Georgia Inst. Tech.

Sami, Sabri, PhD.

Sangster, William McCoy, MSCE.

Wu, Tze Sun, PhD.

Asst. Prof: Irby, Howard Edgar, MS.

Peterson, Jack Sterling, MS. (Resigned 8/31/57)

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD. (See Administration)
- Assoc. Prof: Hogan, Joseph C., PhD.
Lago, Gladwyn V., PhD.
Lamb, John Frazer, PhD.
- Asst. Prof: Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE.
- Instructor: Benningfield, Lloyd M., BSEE, Okla. State.
Calabrese, Carmelo, MSEE, Missouri.
Cheng, David H. S., BA, St. John's U, China; MA, BSEE, Missouri.
Combs, Robert G., BSEE, Missouri.

Mechanical Engineering

- Professor: Scolah, Ralph L., PhD, Chairman.
Bolstad, Milo M., PhD.
Croft, Huber O., MS. (See Administration)
Eastman, Robert M., PhD.
Phillips, Ernest C., ME. (Emeritus)
- Assoc. Prof: Beach, Harry Lee, MS.
Kessler, Charles J., BSME, Mich.
Miller, Walter H., AM. (See Administration)
Pringle, Oran Allen, MSME.
Smith, Eastman, ScD.
Sneed, Carl Miller, Ms.
- Asst. Prof: Burton, Ralph A., PhD.
Gibson, Donald L., MSME.
Moore, Gordon L., MS.
- Instructor: Brooks, Phillip E. J., MEd.
Brown, Robert D., BSME.
Harris, Franklin Dee, BSME.
Larew, Samuel A., BSME, Tennessee; MS, New Haven Coll.
Morris, Charles W., BSME, Missouri.

COLLEGE OF ENGINEERING

1957-58

Administration

- Elmer Ellis, PhD, LLD, President.
- Frederick A. Middlebush, PhD, LLD, President Emeritus; Director University Development Fund; Professor of Political Science.
- Huber O. Croft, MS, Dean of Faculty, College of Engineering Director of Engineering Experiment Station; Professor of Mechanical Engineering.
- J. Pitts Jarvis, Jr., BSME, Arkansas, Associate Director of Engineering Experiment Station (effective 2/1/58); Assistant Professor of Industrial Engineering.
- Jack Ward Morgan, BS, MS, Kansas State Coll.; EdD, Mo., Assistant to Dean, Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Beasley, Robert P., AM.
Stewart, Robert Edwin, PhD.
- Assoc. Prof: Brooker, Donald Brown, MSAgE.
Day, C. LeRoy, PhD.
Hodges, Teddy Omar, MSAgE.
- Asst. Prof: Cromwell, Charles F., Jr., BSEng.
McFate, Kenneth LaVerne, BSAgE.
McKibben, James Sam, MSAgE.
- Instructor: Curry, R. Bruce, MS.
Shanklin, Milton, D., MSAgE.

Chemical Engineering

- Professor: Beyer, Gerhard H., PhD, Chairman.
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
- Asst. Prof: de Chazal, L. E. Marc, PhD.

Civil Engineering

- Professor: Wood, Horace W., Jr., MS, Chairman.
Murphy, Lindon J., PCE.
Pauw, Adrian, PhD.
Rubey, Harry, CE. (Professor Emeritus)
- Assoc. Prof: Evans, Karl Held, MSCE.
Harris, Mark Pickett, MSCE.
Irby, Howard Edgar, MSCE.
Sami, Sabri (Resigned 8/31/58)
Sangster, William M., MSCE.
Wang, Shou-ling, BSCE, MSCE, Missouri.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Waidelich, Donald L., PhD.
- Assoc. Prof: Hogan, Joseph C., PhD.
Lago, Gladwyn V., PhD.
Lamb, John Frazer, ScD.
- Asst. Prof: Benningfield, Lloyd M., MSEE, Missouri.
Calabrese, Carmelo, MSEE.
Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE. (Sabbatical)
- Instructor: Capps, Daniel R., BSEE, Missouri.
Cheng, David H. S., MSEE, Missouri.
Combs, Robert G., BSEE.
Hubbell, Ira G., BSEE, Missouri. (Effective 2/1/58)

Mechanical Engineering

- Professor: Scoria, Ralph L., PhD, Chairman.
Bolstad, Milo M., PhD.
Croft, Huber O., MS. (See Administration)
Eastman, Robert M., PhD.
Phillips, Ernest C., ME. (Emeritus)
- Assoc. Prof: Beach, Harry Lee, MS.
Burton, Ralph Ashby, PhD. (Resigned 8/31/58)
Kessler, Charles J., BSME.
Miller, Walter H., AM.
Morgan, Jack W., EdD. (See Administration)
Pringle, Oran Allen, MSME.
Smith, Eastman, ScD.
Sneed, Carl Miller, MS.
- Asst. Prof: Bolner, Thomas Edward, BSME, Missouri.
Gibson, Donald L., MSME.
Jarvis, J. Pitts, BSME. (See Administration)
Moore, Gordon L., MSME.
- Instructor: Brooks, Phillip E. J., MEd.
Brown, Robert D., BSME.
Harris, Franklin Dee, BSME.
LaRue, Samuel A., MSME.
McClain, Raymond G., BSME, Missouri.
Morris, Charles W., BSME.

COLLEGE OF ENGINEERING

1958-59

Administration

- Elmer Ellis, PhD, LLD, President.
Frederick A. Middlebush, PhD, LLD, President Emeritus; Director University Development Fund; Professor of Political Science.
Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
J. Pitts Jarvis, Jr., BSME, Associate Director of Engineering Experiment Station; Assistant Professor of Industrial Engineering.
Jack W. Morgan, EdD, Assistant to Dean; Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Beasley, Robert P., AM.
Stewart, Robert E., PhD.
Wooley, John C, MS (Emeritus)
- Assoc. Prof: Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.

- Asst. Prof: Cromwell, Charles F., Jr., BSEng.
 McFate, Kenneth L., MSAgE, Missouri.
 McKibben, James S., MSAgE.
- Instructor: Curry, R. Bruce, MS.
 Smerden, Ernest T., BSAgE, Missouri.

Chemical Engineering

- Professor: Beyer, Gerhard H., PhD, Chairman.
 Lorah, James R., PhD.
 Luebbbers, Ralph H., PhD.
- Assoc. Prof: de Chazal, L. E. Marc, PhD.

Civil Engineering

- Professor: Wood, Horace W., Jr., MS
 Murphy, Lindon J., PCE. (On leave)
 Pauw, Adrian, PhD.
 Rubey, Harry, CE. (Emeritus)
 Babbitt, Harold E., MS, *Visiting* Professor.
- Assoc. Prof: Evans, Karl Held, MSCE.
 Harris, Mark P., MSCE
 Irby, Howard Edgar, MSCE.
 Milner, Walker W., BS, U. S. Mil. Academy; MS, Iowa.
 Sangster, William M. MSCE.
 Wang, Shou-ling, PhD.
- Asst. Prof: Breen, John F., MSCE.
 Dallam, Lawrence N., MSCE.
 Jeffrey, Edgar Allen, BSCE, MS, San. Engr., PhD, Iowa. (Eff. 3/1/59)
- Instructor: Crull, Carroll M., BSCE, Miss.

Electrical Engineering

- Professor Wallis, Clifford M., ScD, Chairman.
 Hogan, Joseph Charles, PhD.
 Lago, Gladwyn V., PhD.
 Waidelich, Donald L., PhD.
- Assoc. Prof: Lamb, John Frazer, ScD.
- Asst. Prof: Benningfield, Lloyd M., MSEE.
 Calabrese, Carmelo, MSEE.
 Vredenburgh, Edward J., MSEE.
- Instructor: Capps, Daniel R., BSEE.
 Cheng, David H., MSEE, Missouri.
 Childress, Dudley, BSEE, MSEE, Missouri. (Effective 2/1/59)
 Hubbell, Ira G., MSEE, Missouri. (Resigned 8/31/59)
 Maurer, John R., BSEE, MSEE, Missouri.

Industrial Engineering

- Professor: Eastman, Robert M., PhD., Chairman.
- Asst. Prof: Jarvis, J. Pitts, Jr., BSME. (See Administration)
- Instructor: Rancy, Lee Charles, BSIE, Okla. State.

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD, Chairman.
Croft, Huber O., MS. (See Administration)
Phillips, Ernest C., ME. (Emeritus)
Scorah, Ralph L., PhD.
- Assoc. Prof: Beach, Harry Lee, MS.
Kessler, Charles, BSME.
Love, John, Jr., MS.
Miller, Walter H., AM. (Retired 8/31/59)
Morgan, Jack Ward, EdD. (See Administration)
Pringle, Oran Allen, MS.
Smith, Eastman, ScD.
Sneed, Carl Miller, MS.
- Asst. Prof: Gibson, Donald L., MSME.
Moore, Gordon L., MSME.
Young, Ross D., BSME, MSME, Iowa State.
- Instructor: Brooks, Phillip E. J., M.Ed.
Brown, Robert D., BSME.
Harris, Franklin Dee, BSME.
LaRue, Samuel A., MSME.
McClain, Raymond G., BSME, Missouri.
Morris, Charles W., BSME.

COLLEGE OF ENGINEERING 1959-60

Administration

- Elmer Ellis, PhD, LLD, President of the University.
Frederick A. Middlebush, PhD, LLD, President Emeritus; Director of University Development Fund; Professor of Political Science.
Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
J. Pitts Jarvis, Jr., BSME, Associate Director of Engineering Experiment Station; Assistant Professor of Industrial Engineering.
Jack W. Morgan, EdD, Assistant to Dean; Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

- Professor: Jones, Mack M., MS, Chairman.
Beasley, Robert P., AM.
Stewart, Robert E., PhD.
Wooley, John C., MS. (Emeritus)
- Assoc. Prof. Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Shanklin, Milton, PhD, Missouri.

Asst. Prof: Cromwell, Charles F., Jr., BS.
McFate, Kenneth L., BSAgE.
McKibbon, James S., MSAgE.
Weston, Curtis, DED. (Ag. Educ. & Agr. Engr.)
Instructor: Curry, R. Bruce, MS.

Chemical Engineering

Professor: Beyer, Gerhard H., PhD, Chairman.
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
Assoc. Prof: de Chazal, L. E. Marc, PhD. (Sabbatical leave)
Asst. Prof: Storvick, Truman S., BSChE, Iowa State; PhD, Purdue.

Civil Engineering

Professor: Wood, Horace W., Jr., MS.
Murphy, Lindon J., PCE.
Pauw, Adrian, PhD.
Rubey, Harry, CE. (Emeritus)
Assoc. Prof: Comins, Harrison D., MS.
Evans, Karl Held, MSCE.
Harris, Mark P., MSCE.
Irby, Howard Edgar, MSCE.
Milner, Walker W., MS.
Sangster, William M., MSCE.
Wang, Shou-ling, PhD. (Resigned 1/31/60)
Asst. Prof: Breen, John E., MSCE. (L/A)
Dallam, Lawrence N., MSCE.
Jeffrey, Edgar A., PhD. (Sanitary Engineering)
Instructor: Meyers, Bernard L., BCE, Brooklyn Poly; MSCE, Missouri.

Electrical Engineering

Professor: Wallis, Clifford M., ScD, Chairman.
Hogan, Joseph Charles, PhD.
Lago, Gladwyn V., PhD.
Waidelich, Donald L., PhD.
Assoc. Prof: Lamb, John Frazer, ScD.
Asst. Prof: Benningfield, Lloyd M., MSEE.
Calabrese, Carmelo, MSEE.
Capps, Daniel Robert, BSEE, MSEE, Missouri
Tudor, James R., MSEE.
Vredenburgh, Edward J., MSEE.
Instructor: Cheng, David H. S., MSEE.
Childress, Dudley, MSEE.
Maurer, John R., Jr., MSEE.

Industrial Engineering

Professor: Eastman, Robert M., PhD., Chairman.
Assoc. Prof: Beauchamp, James M., Jr., BSIE, MSIE, Lehigh Univ.

Asst. Prof: Jarvis, J. Pitts, Jr., BSME. (See Administration)
Instructor: Raney, Lee Charles, BSIE.

Mechanical Engineering

Professor: Bolstad, Milo M., PhD., Chairman.
Croft, Huber O., MS. (See Administration)
Scorah, Ralph L., PhD.

Assoc. Prof: Beach, Harry Lee, MS. (Retired perm. disability 8/31/60)
Gaskell, Alfred S, BSME, MSME, Iowa State.
Gibson, Donald L., MSME.
Miller, Walter H, AM. (1/2 time)
Moore, Gordon L., MSME.
Morgan, Jack W., EdD. (See Administration)
Pringle, Oran Allen, MS.
Smith, Eastman, ScD.
Sneed, Carl M., MS.

Asst. Prof: Brown, Robert D., MSME. (Resigned 8/31/60)

Instructor: Brooks, Phillip E. J., M. Ed.
Harris, Franklin Dee, MSME, Missouri.
Larew, Samuel A., MSME
McClain, Raymond G., BSME.
Morris, Charles W., BSME.

COLLEGE OF ENGINEERING 1960-61

Administration

Elmer Ellis, PhD, LLD, President of the University.
Frederick A. Middlebush, PhD, LLD, President Emeritus and Professor Emeritus of Political Science.
Huber O. Croft, MS, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Mechanical Engineering.
J. Pitts Jarvis, Jr., BSME, Associate Director of Engineering Experiment Station; Assistant Professor of Industrial Engineering.
Jack W. Morgan, EdD, Assistant to Dean; Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

Professor: Jones, Mack M., MS, Chairman.
Beasley, Robert P., AM.
Stewart, Robert E., PhD. (Resigned 6/30/61)
Wooley, John C., MS. (Emeritus)

Assoc. Prof: Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Shanklin, Milton D., PhD.

Asst. Prof: Cromwell, Charles F., Jr., MS.
McFate, Kenneth L., MSAgE.
McKibben, James S., MSAgE.
Weston, Curtis R., EdD.

Chemical Engineering

- Professor: Beyer, Gerhard H., PhD, Chairman.
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
- Assoc. Prof: deChazal, L. E. Marc, PhD.
Emmons, Arbath H, BS Chem, Dubuque Univ; MS Chem, PhD,
Mich. (Also Director of Nuclear Reactor Facility - Effective 2/60.)
- Asst. Prof: Storvick, Truman S., PhD.

Civil Engineering

- Professor: Wood, Horace W., Jr., MS, Chairman.
Murphy, Lindon J., PCE.
Pauw, Adrian, PhD.
Rubey, Harry, CE. (Emeritus)
- Assoc. Prof: Baldwin, James Warren, Jr., BS, MS, PhD, Illinois.
Comins, Harrison D., MS.
Evans, Karl Held, MSCE.
Harris, Mark P., MSCE.
Irby, Howard Edgar, MSCE.
Milner, Walker W., MS.
Sangster, William M., MSCE.
- Asst. Prof: Alock, Donald G., MS, MA.
Dallam, Lawrence N., MSCE.
Jeffrey, Edgar Allen, PhD. (Sanitary Engrg.)
- Lecturer: Porter, Horace L., MSCE.
- Instructor: Meyers, Bernard L., MS, Missouri.

Electrical Engineering

- Professor: Waidelich, Donald L., PhD, Acting Chairman.
Hogan, Joseph C., PhD.
Lago, Gladwyn V., PhD.
Lamb, John F., ScD.
Wallis, Clifford M., ScD. (On leave)
- Assoc. Prof: Tudor, James R., PhD, Ill. Inst. Tech.
- Asst. Prof: Benningfield, Lloyd M., MSEE.
Calabrese, Carmelo, MSEE.
Capps, Daniel R., MSEE.
Childress, Dudley S., MSEE.
Maurer, John R., Jr., MSEE.
Vredenburgh, Edward J., Jr., MSEE.
Waid, Rex A., BA Math, Wm. Jewell Col; BSEE, MSEE, Mis-
souri.
- Instructor: Cheng, David H. S., MSEE.
Mason, Richard L., BSEE, Mo. Schl. of Mines; MSEE, Wisc.

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.

Assoc. Prof: Beauchamp, James M., Jr., MSIE,
Asst. Prof: Jarvis, J. Pitts, Jr., BSME. (See Administration)
Raney, Lee C., MSIE, Missouri.

Mechanical Engineering

Professor: Bolstad, Milo M., PhD, Chairman.
Croft, Huber O., MS. (See Administration)
Scorah, Ralph L., PhD.

Assoc. Prof: Gaskell, Alfred S., BSME, MSME, Iowa State.
Gibson, Donald L., MSME.
Love, John, Jr., MS.
Miller, Walter H., AM. (½ time)
Moore, Gordon L., MSME.
Morgan, Jack W., EdD. (See Administration)
Pringle, Oran A., MS.
Smith, Eastman, ScD.
Sneed, Carl Miller, MS.

Asst. Prof: Goldsmith, Ernest H., DLC, Loughborough Col., Eng.; MS, U
of Leeds, Eng.
Harris, Franklin Dee, MSME.
Young, Ross D., MSME.

Instructor: McClain, Raymond G., BSME.
Morris, Charles W., BSME.
Shaw, Billy Wayne, M. Ed., Missouri.
Stevens, Charles A., BSME, Colo. State; MSME, Worcester Poly-
tech.

COLLEGE OF ENGINEERING

1961-62

Administration

Elmer Ellis, PhD, LLD, President of the University.
Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
Joseph Charles Hogan, BSEE, Washington Univ.; MSEE, Missouri; PhD, Wis-
consin, Acting Dean of Faculty, College of Engineering; Acting Director of
Engineering Experiment Station; Professor of Electrical Engineering (9/1/61-
2/15/62). Appointed *Dean* of Faculty, College of Engineering; *Director* of
Engineering Experiment Station; Professor of Electrical Engineering (*effective*
2/16/62.)

Huber O. Croft, MS, Dean Emeritus of College of Engineering; Director Emer-
itus of Engineering Experiment Station; Professor of Mechanical Engineering.

J. Pitts Jarvis, Jr., BSME, Associate Director of Engineering Experiment Sta-
tion; Assistant Professor of Industrial Engineering.

Jack W. Morgan, EdD, Assistant Dean, College of Engineering, Associate Pro-
fessor of Mechanical Engineering, and Director of Engineering Placement
Office.

Agricultural Engineering

- Professor: Jones, Mack M., MS Chairman.
Beasley, Robert P., AM.
Wooley, John C., MS. (Emeritus)
- Assoc. Prof. Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Shanklin, Milton D., PhD.
- Asst. Prof: Cromwell, Charles F., Jr., MS.
McFate, Kenneth L., MSAgE.
McKibben, James S., MSAgE.
Weston, Curtis R., EdD.

Chemical Engineering

- Professor: Beyer, Gerhard H., PhD, Chairman.
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
- Assoc. Prof: de Chazal, L. E. Marc, PhD.
Emmons, Ardath H., PhD. (Also Director, Nuclear Reactor Facility)
Storvick, Truman S., PhD.

Civil Engineering

- Professor: Wood, Horace W., Jr., MS, Chairman.
Murphy, Lindon J., PCE.
Pauw, Adrian, PhD.
Sangster, William M., MSCE.
Rubey, Harry, CE. (Emeritus)
- Assoc. Prof: Baldwin, James W, Jr., PhD.
Comins, Harrison D., MS.
Evans, Karl Held, MSCE.
Harris, Mark P., MSCE.
Irby, Howard Edgar, MSCE. (Deceased 10/5/61)
Milner, Walker W., MS.
- Asst. Prof: Dallam, Lawrence N., MSCE.
Jeffrey, Edgar A., PhD. (Sanitary Engr.)
Meyers, Bernard L., MS.
- Lecturer: Porter, Horace L., MSCE.
- Instructor: Buchert, Kenneth P., BSCE, MSCE, Missouri.
Denson, Keith H., BSCE, Washington Univ.; MS, Miss. State.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Hogan, Joseph C., PhD.
Lago, Gladwyn V., PhD.
Lamb, John F., ScD.
Waidelich, Donald L., PhD. (Sabbatical)
- Assoc. Prof: Tudor, James R., PhD.

- Asst. Prof: Benningfield, Lloyd M., MSEE. (On leave)
 Capps, Daniel R., MSEE.
 Childress, Dudley S., MSEE.
 Maurer, John R., Jr., MSEE.
 Vredenburgh, Edward J., Jr., MSEE.
 Waid, Rex A., MSEE.
- Instructor: Calabrese, Carmelo, MSEE.
 Cheng, David H. S., MSEE.
 James, Charles W., BS, Washington Univ.
 Rinard, George A., BSEE, MSEE, Missouri.
 Zobrist, George W., BSEE, Missouri; MSEE, U. of Wichita.

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.
- Assoc. Prof: Beauchamp, James M., Jr., MSIE.
 Covert, Richard P., BSEE, Iowa State; MSIE, Iowa U.
- Asst. Prof: Jarvis, J. Pitts, Jr., BSME. (See Administration)
- Instructor: David, Larry Gene, BSIE, MSIE, U. of Arkansas.

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD, Chairman.
 Croft, Huber O., MS. (See Administration)
 Scolah, Ralph L., PhD.
- Assoc. Prof: Gaskell, Alfred S., MSME.
 Gibson, Donald L., MSME.
 Love, John, Jr., MS.
 Miller, Walter H., AM. (½ time)
 Moore, Gordon L., MSME.
 Morgan, Jack W., EdD. (See Administration)
 Pringle, Oran A., MSME.
 Smith, Eastman, ScD.
 Sneed, Carl M., MS.
- Asst. Prof: Goldsmith, Ernest H., MS.
 Harris, Franklin Dee, MSME.
 Morris, Charles W., MSME.
 Young, Ross D., MSME.
- Instructor: Bunch, Gaylord H., BSME, Missouri.
 McClain, Raymond G., BSME.
 Shaw, Billy Wayne, MEd.
 Stevens, Charles A., MSME.

COLLEGE OF ENGINEERING 1962-63

Administration

Elmer Ellis, PhD, LLD, President of the University.

Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
Joseph C. Hogan, PhD, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Electrical Engineering.
Huber O. Croft, MS, Dean Emeritus of College of Engineering; Director Emeritus of Engineering Experiment Station; Professor of Mechanical Engineering.
Jack W. Morgan, EdD, Assistant Dean; Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

Professor: Walton, Harold Vincent, BS, Penn State U., PhD, Purdue, Chairman.
Beasley, Robert P., AM.
Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Jones, Mack M., MS.
Shanklin, Milton D., PhD.
Assoc. Prof: McFate, Kenneth L., MSAgE.
McKibben, James S., MSAgE.
Weston, Curtis R., EdD.
Asst. Prof: Cromwell, Charles F., Jr., MS.
Instructor: Butchbaker, Allan, MS.

Chemical Engineering

Professor: Beyer, Gerhard H., PhD. (Sabbatical)
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
Assoc. Prof: de Chazal, L. E. Marc, PhD, Acting Chairman.
Emmons, Ardath H., PhD. (Also Director, Nuclear Reactor Facility)
Storvick, Truman S., PhD.

Civil Engineering

Professor: Wood, Horace W., Jr., MS, Chairman.
Murphy, Lindon J., PCE.
Pauw, Adrian, PhD.
Rubey, Harry, CE. (Emeritus)
Sangster, William M., MSCE.
Assoc. Prof: Baldwin, James W., Jr., PhD.
Comins, Harrison D., MS.
Evans, Karl Held, MS.
Harris, Mark P., MSCE.
Jeffrey, Edgar A., PhD. (Resigned 8/31/63)
Milner, Walker W., MS.
Stickney, George H., BS, Vermont; MBA, Harvard; MSE, PhD, Michigan.

- Asst. Prof: Dallam, Lawrence N., MSCE.
 Douty, Richard T., BSCE, Lehigh; MS, Georgia Tech; PhD, Cornell.
 Meyers, Bernard L., MS.
- Instructor: Buchert, Kenneth P., MSCE.
 Pugh, Richard N., BA, BSE, Iowa; MS, U. of Rochester.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc., Chairman.
 Hogan, Joseph C., PhD. (See Administration)
 Lago, Gladwyn V., PhD.
 Lamb, John F., ScD.
 Waidelich, Donald L., PhD.
- Assoc. Prof: Carter, Robert L., BS Engr. Physics, Okla; PhD, Duke.
 Tudor, James R., PhD.
- Asst. Prof: Benningfield, Lloyd M., MSEE.
 Capps, Daniel R., MSEE. (Resigned 8/31/63)
 Childress, Dudley S., MSEE. (On leave)
 Maurer, John R., Jr., MSEE. (Resigned 8/31/63)
 Vredenburgh, Edward J., Jr., MSEE.
 Waid, Rex A., MSEE.
- Instructor: Calabrese, Carmelo, MSEE.
 Cheng, David H. S., MSEE.
 Fitzgerald, Duane G., BS & MS, Mich. (Also Reactor Supr.)
 Rinard, George A., MSEE.
 Zobrist, George W., MSEE.

Industrial Engineering

- Professor: Eastman, Robert M., PhD. (Sabbatical)
- Assoc. Prof: Beauchamp, James M., Jr., MS, Chairman.
- Asst. Prof: Jarvis, J. Pitts, BSME.
- Instructor: David, Larry Gene, MSIE.

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD, Chairman.
 Croft, Huber O., MS. (See Administration)
 Scolah, Ralph L., PhD.
- Assoc. Prof: Gaskell, Alfred S., MSME.
 Gibson, Donald L., MSME.
 Love, John, Jr., MS.
 Moore, Gordon L., MSME.
 Morgan, Jack W., EdD. (See Administration)
 Pringle, Oran A., MSME.
 Smith, Eastman, ScD.
 Sneed, Carl M., Jr., MS.
- Asst. Prof: Goldsmith, Ernest H., MS.
 Harris, Franklin Dee, MSME. (On leave)
 Young, Ross D., MSME.

Instructor: Bunch, Gaylord H., BSME.
Keown, William H., BME, MME, Auburn U.
McClain, Raymond G., MSME, Missouri.
Stevens, Charles A., MSME.

COLLEGE OF ENGINEERING 1963-64

Administration

Elmer Ellis, PhD, LLD, President of the University.
Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
Joseph C. Hogan, PhD, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Electrical Engineering.
Huber O. Croft, MS, Dean Emeritus of College of Engineering; Director Emeritus of Engineering Experiment Station; Professor of Mechanical Engineering.
William M. Sangster, BSCE, MS, Iowa, Associate Director of Engineering Experiment Station; Professor of Civil Engineering.
Jack W. Morgan, EdD, Assistant Dean, Associate Professor of Mechanical Engineering, and Director of Engineering Placement Office.

Agricultural Engineering

Professor: Walton, Harold V., PhD, Chairman.
Beasley, Robert P., AM.
Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Jones, Mack M., MS.
Shanklin, Milton D., PhD.
Wooley, John C., MS. (Emeritus)
Assoc. Prof: McFate, Kenneth L., MSAgE.
McKibben, James S., MSAgE.
Weston, Curtis R., EdD.
Asst. Prof: Cromwell, Charles F., Jr., MSAgE.

Chemical Engineering

Professor: Beyer, Gerhard H., PhD, Chairman. (Also Nuclear Engr.)
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
Assoc. Prof: de Chazal, L. E. Marc, PhD. (Also Nuclear Engr.)
Emmons, Ardath H., PhD. (Also Director, Nuclear Reactor Facility)
Storvick, Truman S., PhD.
Asst. Prof: Winnick, Jack, BS, Illinois; MS, PhD, Oklahoma.

Civil Engineering

Professor: Pauw, Adrian, PhD, Chairman.
Murphy, Lindon J., PCE.
Rubey, Harry, CE. (Emeritus)
Sangster, William M., MS. (See Administration)
Wood, Horace W., Jr., MS.

- Assoc. Prof: Baldwin, James W., Jr., PhD.
 Comins, Harrison D., MS.
 Evans, Karl H., MSCE.
 Harris, Mark P., MSCE.
 Milner, Walker W., MS.
 Ray, Arliss D., BE. Yale; MS, Oregon State; PhD, Calif.
 Stickney, George H., PhD. (Also Mechanical Engr.)
- Asst. Prof: Buettner, Donald R., BSCE, MSCE & PhD, Wisconsin.
 Cassidy, John J., BSCE.
 Dallam, Lawrence N., MSCE. (On leave)
 Douty, Richard T., PhD.
 Lenau, Charles W., BSCE, MSCE, Texas Tech. College.
 Meyers, Bernard L., MS. (Resigned 8/31/64)
 Ward, Roscoe F., BA, College of Idaho; BSCE, Oregon State,
 MS, Washington State, ScD, Washington Univ.
- Lecturer: Porter, Horace L., MSCE.
- Instructor: Buchert, Kenneth P., MSCE.
 Pugh, Richard N., MS.

Electrical Engineering

- Professor: Wallis, Clifford M., ScD, Chairman.
 Carter, Robert L., PhD.
 Hogan, Joseph C., PhD. (See Administration)
 Lago, Gladwyn V., PhD.
 Lamb, John F., ScD.
 Waidelich, Donald L., PhD.
- Assoc. Prof: Tudor, James R., PhD.
- Asst. Prof: Benningfield, Lloyd M., MSEE.
 Childress, Dudley S., MSEE. (On leave)
 Dwyer, Samuel Joseph III, BSEE, MSEE, PhD, Texas.
 Vredenburgh, Edward J., Jr., MSEE.
 Waid, Rex A., MS. (On leave)
- Instructor: Calabrese, Carmelo, MSEE.
 Cheng, David H. S., MSEE.
 Fitzgerald, Duane G., MS. (Also Reactor Supr.)
 Marshall, Stanley V., BSEE, Ore. State College.
 Rinard, George A., MSEE.
 Sherman, Byron W., BSEE, MSEE, Missouri.
 Zobrist, George W., MSEE.

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.
- Assoc. Prof: Beauchamp, James M., Jr.
- Instructor: David, Larry Gene, MSIE. (Resigned 8/31/64)

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD., Chairman.
 Croft, Huber O., MS. (See Administration)

- Gaskell, Alfred S., MSME.
 Scorah, Ralph L., PhD.
- Assoc. Prof: Gibson, Donald L., MSME.
 Love, John, Jr., MS.
 Lysen, John C., BA, St. Olaf College; BS, PhD, Iowa State.
 Miles, John B., BSME, MSME, Mo. Schl. Mines; PhD, Ill.
 Moore, Gordon Lee, MSME.
 Morgan, Jack W., EdD. (See Administration)
 Pringle, Oran A., MSME. (On leave)
 Smith, Eastman, ScD. Retired 1/31/64)
 Stickney, George H., PhD. (Mechanical & Civil)
 Sneed, Carl M., Jr., MS. (On leave)
- Asst. Prof: Goldsmith, Ernest H., MS.
 Harris, Franklin Dee, MSME. (On leave)
 Stevens, Charles A., MSME.
 Young, Ross D., MSME.
- Instructor: Bunch, Gaylord H., BSME.
 Keown, William H., MME.
 McClain, Raymond G., MSME.
 McKinnon, Charles N., Jr., BSME, MSAE, Calif. Inst. Tech.

COLLEGE OF ENGINEERING 1964-65

Administration

- Elmer Ellis, PhD, LLD, President of the University.
 Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
 John W. Schwada, PhD, Dean of Faculties.
 Joseph C. Hogan, PhD, Dean of Faculty, College of Engineering; Director of
 Huber O. Croft, MS, Dean Emeritus of College of Engineering; Director Emeritus
 of Engineering Experiment Station; Professor of Mechanical Engineering.
 William M. Sangster, MSCE, Associate Director of Engineering Experiment Station;
 Professor of Civil Engineering.
 Jack W. Morgan, EdD, Assistant Dean of College of Engineering; Associate
 Professor of Mechanical Engineering; Director of Engineering Placement Office.

Agricultural Engineering

- Professor: Walton, Harold V., PhD, Chairman.
 Beasley, Robert P., AM.
 Brooker, Donald B., MSAgE.
 Day, C. LeRoy, PhD.
 Jones, Mack M., MS.
 Shanklin, Milton D., PhD.
 Wooley, John C., MS. (Emeritus)

- Assoc. Prof: McFate, Kenneth L., MSAgE.
 McKibben, James S., MSAgE.
 Weston, Curtis R., EdD.
- Asst. Prof: Cromwell, Charles F., Jr., MS. (Sabbatical)
- Instructor: Pochop, Larry O., BS, S. Dakota State College; MS, Missouri.

Chemical Engineering

- Professor: Preckshot, George W., BS, Illinois; MS, PhD, Michigan, Chairman.
 Lorah, James R., PhD.
 Luebbers, Ralph H., PhD.
- Assoc. Prof: de Chazal, Louis E. Marc, PhD. (Also Nuclear Engr.)
 Storvick, Truman S., PhD.
- Asst. Prof: Angus, Richard M., BS, Illinois; PhD, Princeton.
 Morgan, Robert P., BS, Cooper Union; SM-ChE, Nuclear Engrg, M.I.T.; (PhD, Rensselaer Polytech.)
 Winnick, Jack, PhD.

Civil Engineering

- Professor: Pauw, Adrian, PhD, Chairman.
 Murphy, Lindon J., PCE.
 Rubey, Harry, CE. (Emeritus)
 Sangster, William M., PhD, Univ. of Iowa. (See Administration)
 Wood, Horace W., Jr., MS. (Emeritus)
- Assoc. Prof: Baldwin, James W., Jr., PhD.
 Buchert, Kenneth P., PhD, Missouri.
 Comins, Harrison D., MS.
 Evans, Karl H., MSCE. (On leave)
 Harris, Mark P., MSCE.
 Milner, Walker W., MS.
 Poertner, Herbert G., BS, MS, Washington Univ. (Resigned 8/31/65)
 Ray, Arliss D., PhD.
 Stickney, George H., PhD. (Also Mechanical Engr.)
 Wheeler, Robert J., BSCE, MSCE, PhD, Iowa.
- Asst. Prof: Buettner, Donald R., PhD.
 Cassidy, John J., PhD, Iowa.
 Dallam, Lawrence N., MSCE. (On leave)
 Douty, Richard T., PhD.
 King, Darrell L., BS, Montana State Coll; MS, PhD, Michigan State.
 Lenau, Charles W., PhD, Stanford Univ.
 Salmons, John R., BSCE, Missouri; PhD, Arizona.
 Ward, Roscoe F., ScD, Washington Univ.
- Instructor: Pugh, Richard N., MS.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.

- Carter, Robert L., PhD. (Also Nuclear Engr.)
 Hogan, Joseph C., PhD. (See Administration)
 Lago, Gladwyn V., PhD.
 Lamb, John F., ScD. (Res. Assoc., Space Science Research Cntr.
 2/1-6/30/65
 Waidelich, Donald L., PhD.
- Assoc. Prof: Tudor, James R., PhD.
- Asst. Prof: Benningfield, Lloyd M., MSEE. (Sabbatical 2/1/5 - 8/31/65)
 Charlson, Earl J., BSEE, Mo. School of Mines; PhD, Carnegie
 Tech.
 Cheng, David H. S., PhD, Missouri.
 Childress, Dudley S., MSEE. (On leave)
 Combs, Robert G., BSEE, MSEE, Mo.; PhD, Florida. (Eff. 2/1/5 -
 8/31/65)
 Dwyer, Samuel J., Ill., PhD.
 Vredenburgh, Edward J., Jr., MSEE.
 Waid, Rex A., MSEE. (On leave)
 Weathers, Benton D., BSEE, MS, Missouri; PhD, Kansas State.
- Instructor: Calabrese, Carmelo, MSEE.
 Fitzgerald, Duane G., MS. (Also Reactor Supvr.)
 Marshall, Stanley V., BSEE, Oregon State Coll.
 Rinard, George A., MSEE.
 Zobrist, George W., MSEE.

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.
- Assoc. Prof: Beauchamp, James M., Jr., MS.
 Covert, Richard P., PhD, Iowa.
- Asst. Prof: Miller, Owen W., BSIE, MSIE, Washington Univ.

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD, Chairman.
 Croft, Huber O., MS. (Emeritus) See Administration
 Gaskell, Alfred S., MSME.
 Scorah, Ralph L., PhD.
- Assoc. Prof: Gibson, Donald L., MSME.
 Love, John, Jr., MS.
 Lysen, John C., PhD.
 Miles, John B., PhD.
 Moore, Gordon Lee, MSME. (On leave)
 Morgan, Jack W., EdD. (See Administration)
 Pringle, Oran A., MSME. (On leave)
 Sneed, Carl M., Jr., MS. (On leave)
 Stickney, George H., PhD. (Also Civil)
- Asst. Prof: Creighton, Donald L., BS, MS, Kansas; PhD, Arizona.
 Goldsmith, Ernest H., MS.
 Harris, Franklin Dee, MSME. (On leave)

Instructor: Stevens, Charles A., MSME.
Young, Ross D., MSME.
Bunch, Gaylord H., MSME, Missouri.
Keown, William H., MME.
McClain, Raymond, MSME.
McKinnon, Charles N., Jr., MSAE.

Nuclear Engineering

Professor: Carter, Robert L., PhD.
Emmons, Ardath H., PhD. (Also Dir. Nuclear Reactor Facility)
Assoc. Prof: de Chazal, L. E. Marc, PhD.
Asst. Prof: Morgan, Robert P., PhD.

COLLEGE OF ENGINEERING

1965-66

Administration

Elmer Ellis, PhD, LLD, President of the University.
Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
John W. Schwada, PhD, Chancellor, Columbia Campus.
Joseph C. Hogan, PhD, Dean of Faculty, College of Engineering, Director of Engineering Experiment Station; Professor of Electrical Engineering.
Huber O. Croft, MS, Dean Emeritus of College of Engineering; Director Emeritus of Engineering Experiment Station; Professor of Mechanical Engineering.
William M. Sangster, PhD, Associate Dean of College of Engineering; Associate Director of Engineering Experiment Station; Professor of Civil Engineering.
Jack W. Morgan, EdD, Assistant Dean of College of Engineering; Associate Professor of Mechanical Engineering; Director of Engineering Placement Office.

Agricultural Engineering

Professor: Walton, Harold V., PhD, Chairman.
Beasley, Robert P., AM.
Brooker, Donald B., MSAgE.
Day, C. LeRoy, PhD.
Jones, Mack M., MS.
Shanklin, Milton D., PhD.
Wooley, John C., MS. (Emeritus)
Assoc. Prof: McFate, Kenneth L., MSAgE.
McKibben, James S., MSAgE.
Weston, Curtis R., EdD. (Also Agr. Ed.)
Asst. Prof: Cromwell, Charles F., Jr., MS. (On leave)
Frisby, James C., BSEd, BSAgE, Missouri; MS, PhD, Iowa State.
Goering, Carroll E., BS, Nebraska; MSAgE, PhD, Iowa State.
Instructor: Pochop, Larry Otto, MS.
Seltzer, Paul Howard, BS, Penn. State.

Chemical Engineering

- Professor: Preckshot, George W., PhD, Chairman.
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.
- Assoc. Prof: de Chazal, Louis E. Marc, PhD. (Also Nuclear Engr.)
Storvick, Truman S., PhD.
- Asst. Prof: Angus, Richard M., PhD.
Lee, Vin-Jang, BS, Engr. Col. Taiwan; MS, Notre Dame; PhD,
Mich.
Morgan, Robert P., PhD. (Also Nuclear Engr.)
Winnick, Jack, PhD.

Civil Engineering

- Professor: Pauw, Adrian, PhD, Chairman.
Baldwin, James W., Jr., PhD. (On leave)
Murphy, Lindon J., PCE.
Rubey, Harry (Emeritus) CE.
Sangster, William M., PhD. (See Administration)
Wood, Horace W., Jr., MS. (Emeritus)
- Assoc. Prof: Buchert, Kenneth P., PhD.
Cassidy, John J., PhD.
Comins, Harrison D., MS.
Douty, Richard T., PhD. (On leave)
Evans, Karl Held, MS. (On leave)
Harris, Mark P., MSCE.
Milner, Walker W., MS.
Ray, Arliss D., PhD.
Stickney, George H., PhD. (Also Mechanical Engr.)
Wheeler, Robert J., PhD.
- Asst. Prof: Abdul-Baki, Assad, BSME, MSCE, PhD, Okla. State.
Buettner, Donald R., PhD.
Dallam, Lawrence N., PhD, Oklahoma State.
Guell, David Lee, BS, MS, PhD, Northwestern.
Hjelmfelt, Allen T., BS, Kans. State; MS, Kansas; PhD North-
western.
King, Darrell L., PhD.
Lane, James Henry, BS, Duke; MS, PhD, North Carolina State.
Lenau, Charles W., PhD.
Liu, Henry, BS, Natl. Taiwan Univ., MS, PhD, Colo. State.
Salane, Harold J., BS, Texas; MS, Rice Univ., PhD, Texas.
Salmons, John R., BSCE, Missouri; MSCE, PhD, Arizona.
- Instructor: Pugh, Richard N., MS.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc, Chairman.
Carter, Robert L., PhD. (Also Nuclear Engr.)
Hogan, Joseph C., PhD. (See Administration)

- Lago, Gladwyn V., PhD.
 Lamb, John F., ScD.
 Tudor, James R., PhD.
 Waidelich, Donald L., PhD.
- Assoc. Prof: Benningfield, Lloyd M., PhD, Purdue.
 Calabrese, Carmelo, PhD, Missouri.
 Hoft, Richard G., BSEE, Iowa State; MEE, Rensselaer Polytech;
 PhD, Iowa State.
- Asst. Prof: Charlson, Earl J., PhD.
 Cheng, David H. S., PhD.
 Childress, Dudley S., MS. (On leave)
 Combs, Robert G., PhD.
 Dwyer, Samuel J. III, PhD.
 McLaren, Robert W., BSEE, MSEE, Illinois; PhD, Purdue.
 Mosher, Clifford C. III, BS Mich. State; MS, Texas; PhD, Stanford.
 Sherman, Byron W., PhD, Missouri.
 Vredenburg, Edward J., Jr., MSEE.
 Waid, Rex A., MSEE. (On leave)
 Weathers, Benton D., PhD.
 Zobrist, George W., PhD, Missouri.
- Instructor: Fitzgerald, Duane G., MS. (Also Reactor Supvr.)

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.
 Beauchamp, James M., MSIE.
- Assoc. Prof: Covert, Richard P., PhD.
 Van der Reyden, Dirk, BA, Pretoria Univ., S. Africa; PhD, N. C.
 State Col.
- Asst. Prof: Miller, Owen W., ScD, Washington Univ.

Mechanical Engineering

- Professor: Bolstad, Milo M., PhD, Chairman.
 Croft, Huber O., MS. (Emeritus) (See Administration)
 Gaskell, Alfred S., MSME.
 Scorah, Ralph L., PhD. (On leave)
- Assoc. Prof: Gibson, Donald L., MSME.
 Love, John, Jr., MS.
 Lysen, John C., PhD.
 Miles, John B., PhD. (On leave)
 Miller, Percy H., BS, Miss. State; MS, Colo., PhD, Texas.
 Moore, Gordon Lee, MSME. (On leave)
 Morgan, Jack W., EdD. (See Administration)
 Pringle, Oran A., MSME. (On leave)
 Sneed, Carl M., Jr., MS.
 Stickney, George H., PhD. (Also Civil Engr.)
 Young, Ross D., MSME.

- Asst. Prof: Creighton, Donald L., PhD.
 Goldsmith, Ernest H., MS.
 Harris, Franklin Dee, MSME.
 Stevens, Charles A., MSME.
- Instructor: Bunch, Gaylord H., MSME.
 McClain, Raymond G., MSME.
 McKinnon, Charles N., MS.

Nuclear Engineering

- Professor: Carter, Robert L., PhD.
 Emmons, Ardath H., PhD. (Also Dir. Nuclear Reactor Facility)
 Preckshot, George W., PhD.
- Assoc. Prof: de Chazal, L. E. Marc, PhD. (Committee Chairman)
 Leddicotte, George W., BA, Lincoln Mem. Univ.
- Asst. Prof: Dowdy, Edward J., BS, St. Mary's Univ., MS, PhD, Texas A & M.
 Morgan, Robert P., PhD.

COLLEGE OF ENGINEERING

1966-67

Administration

- John C. Weaver, PhD, President of the University.
 Elmer Ellis, PhD, LLD, President Emeritus of the University.
 Frederick A. Middlebush, PhD, LLD, President Emeritus of the University.
 John W. Schwada, PhD, Chancellor, Columbia Campus.
 Joseph C. Hogan, PhD, Dean of Faculty, College of Engineering; Director of Engineering Experiment Station; Professor of Electrical Engineering.
 Huber O. Croft, MS, Dean Emeritus of College of Engineering, Director Emeritus of Engineering Experiment Station; Professor Emeritus, Mechanical Engineering.
 William M. Sangster, PhD, Associate Dean, College of Engineering; Associate Director, Engineering Experiment Station; Professor of Civil Engineering.
 Jack W. Morgan, EdD, Assistant Dean of College of Engineering; Professor of Mechanical Engineering; Director of Engineering Placement Office.

Agricultural Engineering

- Professor: Walton, Harold V., PhD, Chairman.
 Beasley, Robert P., AM.
 Brooker, Donald B., MSAgE.
 Day, C. LeRoy, PhD.
 Jones, Mack M., MS. (Emeritus)
 Shanklin, Milton D., PhD.
 Wooley, John C., MS. (Emeritus)
- Assoc. Prof: McFate, Kenneth L., MSAgE.
 McKibben, James S., MSAgE.
 Weston, Curtis R., EdD. (Also Ag. Educ.)

Asst. Prof: Cromwell, Charles F., Jr., MS.
Frisby, James C., PhD.
Goering, Carroll Eugene, PhD.

Instructor: Pochop, Larry O., MS.
Seltzer, Paul H., BS.

Chemical Engineering

Professor: Preckshot, George W., PhD., Chairman.
de Chazal, L. E. Marc, PhD. (Sabbatical)
Lorah, James R., PhD.
Luebbers, Ralph H., PhD.

Assoc. Prof: Storvick, Truman S., PhD.

Asst. Prof: Angus, Richard M., PhD.
Lee, Vin-Jang, PhD.
Morgan, Robert P., PhD. (Also Nuclear Engr.)
Winnick, Jack, PhD.

Civil Engineering

Professor: Pauw, Adrian, PhD, Chairman.
Baldwin, James W., Jr., PhD.
Murphy, Lindon J., PCE.
Rubey, Harry, CE. (Emeritus)
Sangster, William M., PhD. (See Administration)
Wood, Horace W., Jr., MS. (Emeritus)

Assoc. Prof: Buchert, Kenneth P., PhD.
Cassidy, John J., PhD.
Comins, Harrison D., MS.
Dallam, Lawrence N., PhD.
Douty, Richard T., PhD.
Evans, Karl Held, MS.
Harris, Mark P., MSCE.
Hemphill, Louis, BA, MS, N. Texas State; MPh, Mich.; PhD, Mo.
Jordan, Mark H., BS, USN Acad.; BCE, MCE, PhD, Rensselaer.
Milner, Walker W., MS.
Ray, Arliss D., PhD.
Stickney, George H., PhD. (Also Mechanical Engr.)
Wheeler, Robert J., PhD.
Wright, Charles V., BS, Texas A & M; MPH, Calif.

Asst. Prof: Abdul-Baki, Assad, PhD.
Guell, David L., PhD.
Hjelmfelt, Allen T., PhD.
King, Darrell L., PhD.
Lam, Tenny N, BS, ME, Calif.
Lenau, Charles W., PhD.
Liu, Henry, PhD.
Salane, Harold J., PhD.
Salmons, John R., PhD.

Electrical Engineering

- Professor: Wallis, Clifford M., DSc.
Adams, Gayle E., BS, MS, PhD, Wisconsin.
Carter, Robert L., PhD. (Also Nuclear Engr.)
Hogan, Joseph C., PhD. (See Administration)
Lago, Gladwyn V., PhD.
Lamb, John F., ScD.
Tudor, James R., PhD.
Waidelich, Donald L., PhD.
- Assoc. Prof: Benningfield, Lloyd M., PhD.
Calabrese, Carmelo, PhD.
Hoft, Richard G., PhD.
- Asst. Prof: Brubaker, Thomas A., BS, MS, Wyoming; PhD, Arizona.
Carlson, Arthur James, BS, MS, PhD, Iowa.
Charlson, Earl J., PhD.
Cheng, David H. S., PhD.
Combs, Robert G., PhD.
Dwyer, Samuel J. III, PhD.
Fitzgerald, Duane G., PhD, Missouri. (Also Radiological Science)
Mahmoud, Aly A. A., BS, Ain Shams U., Cairo; MS, PhD, Purdue
- Asst. Prof: McLaren, Robert W., PhD.
Mosher, Clifford C. III, PhD
Rathke, James E., BSEE, MS, Missouri; PhD, Kansas.
Sherman, Byron W., PhD.
Sullivan, Daniel D., BS, Notre Dame; MS, Northwestern.
Vredenburgh, Edward J., MSEE.
Waid, Rex A., MSEE.
Weathers, Benton D., PhD.
Zobrist, George W., PhD.
- Instructor: Lamont, John W., BS, UMR; MS, Missouri.

Industrial Engineering

- Professor: Eastman, Robert M., PhD, Chairman.
Beauchamp, James M., Jr., MSIE.
- Assoc. Prof: Covert, Richard P., PhD.
Miller, Owen W., DSc.
Van der Reyden, Dirk, PhD.

Mechanical Engineering

- Professor: Bolstad, Milo M. PhD, Chairman.
Croft, Huber O. Croft, MS. (Emeritus) (See Administration)
Gaskell, Alfred S., MSME.
Morgan, Jack W., EdD. (See Administration)
Scorah, Ralph L., PhD.
- Assoc. Prof: Braisted, Paul W., ScB, Brown U., MME, Syracuse; PhD, Stanford.
Gibson, Donald L., MSME.
Harris, Franklin Dee, PhD, Arkansas.

Love, John, Jr., PhD, Okla. State.
Lysen, John C., PhD.
Miles, John B., PhD.
Miller, Percy H., PhD.
Moore, Gordon Lee, MSME.
Pringle, Oran A., MSME.
Sneed, Carl M., Jr., PhD, Michigan.
Stickney, George H., PhD. (Also Civil Engr.)
Young, Ross D., MSME.

Asst. Prof: Creighton, Donald L., PhD.
Duffield, Roger C., BS, MS, Kansas.
Goldsmith, Ernest H., MS
Ishihara, Teruo, BS, Wash. State; TC, Calif., MS, San Jose State
Coll.
McKinnon, Charles N., PhD, Missouri.
Stevens, Charles A., MSME.

Instructor: Bunch, Gaylord H., MSME.
McClain, Raymond G., MSME.

Nuclear Engineering

Professor: Carter, Robert L., PhD.
de Chazal, L. E. Marc, PhD. (On leave)
Emmons, Ardath H., PhC. (Also Dir. Nuclear Reactor Facility.)

Assoc. Prof: Leddicotte, George W., BA, Lincoln Univ.

Asst. Prof: Dowdy, Edward J., PhD.
Morgan, Robert P., PhD. (Committee Chairman)