A HISTORY OF THE DEPARTMENT OF CHEMISTRY UNIVERSITY OF MISSOURI-COLUMBIA 1843 - 1975

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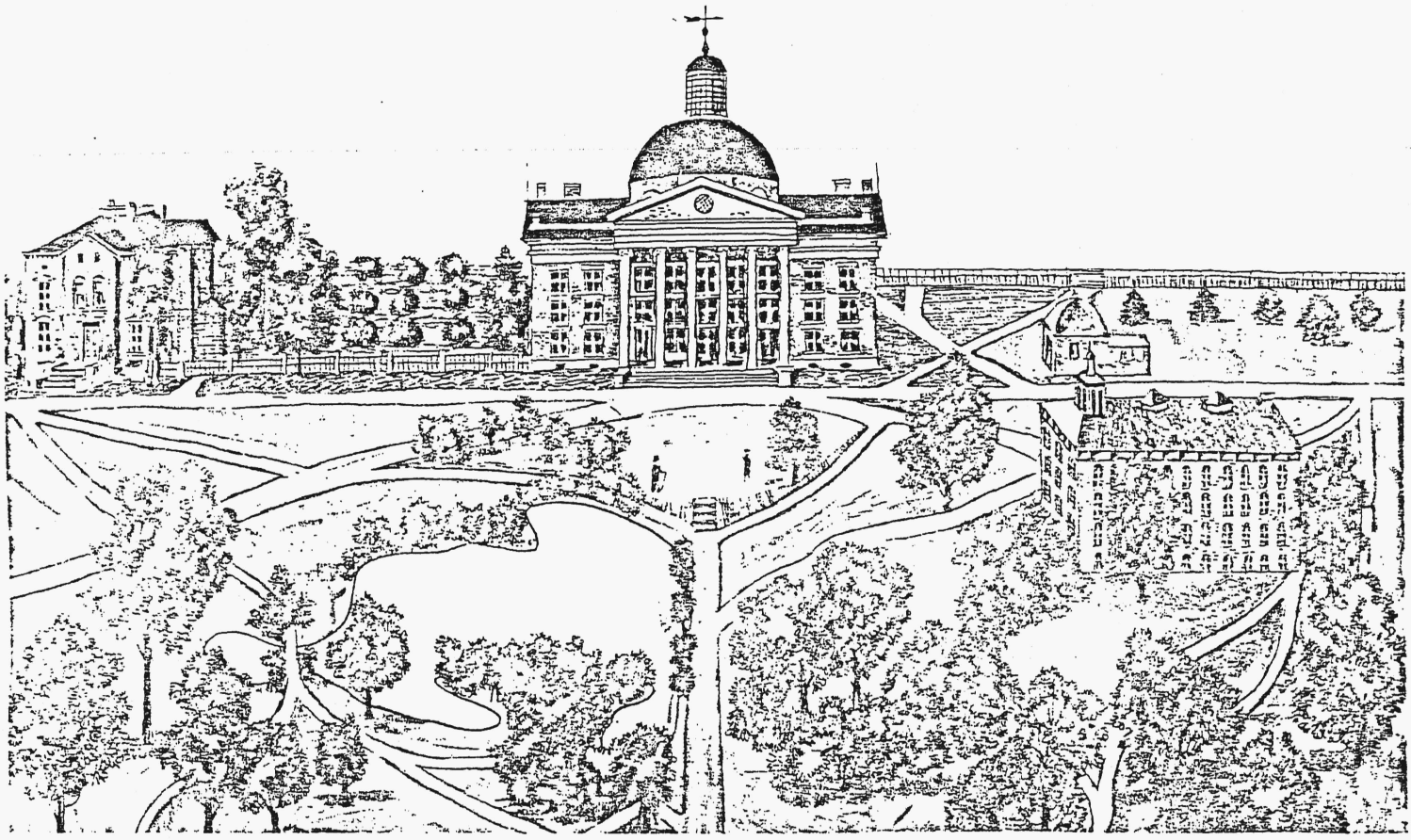
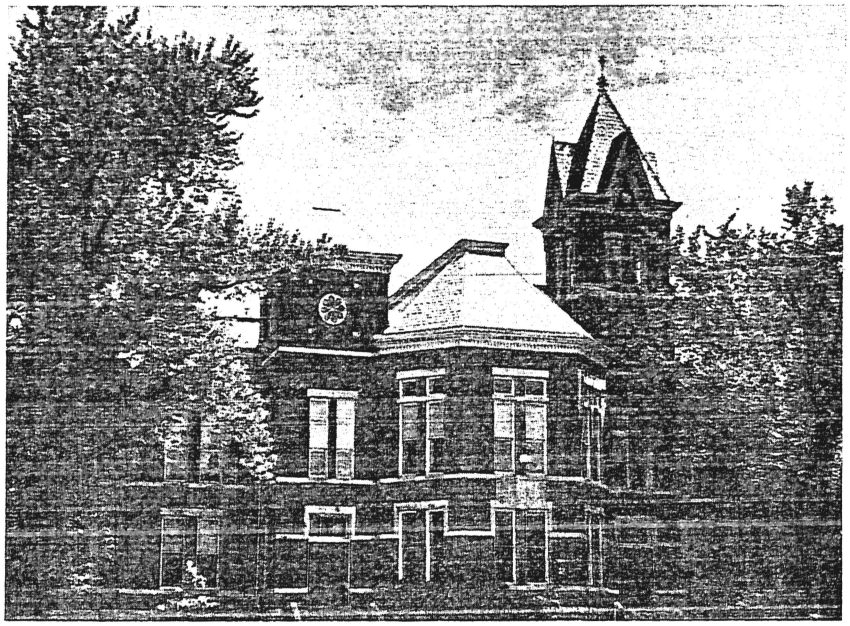
1872



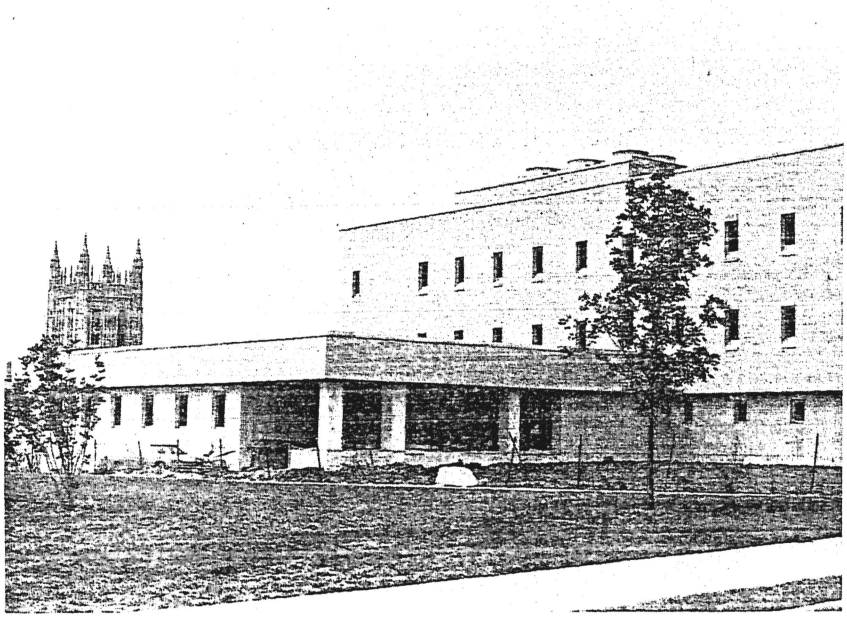
University Hall

The Scientific Building
(Switzler Hall)

Chemistry classes were held in University Hall from 1843 to 1872, then in The Scientific Building from 1872 to 1894. The department moved across the quadrangle to the chemistry building in the Fall of 1894.



1894-1972 The Chemistry Building



1972- The Chemistry Building

CONTENTS

INTRODUCTION

The University catalogs of 1843 to 1910 have been the principal source of information relative to the early development of the chemistry department. Some useful data were found in Frank Stephens' "History of the University of Missouri." Records of departmental meetings were begun in 1910 and furnish data from that time to the present.

For the most part, names of faculty members are not given unless they played an important role in the establishment and growth of the chemistry department.

I. 1843 - 1876

Officially, the University of Missouri was established in 1839, but the first catalog was not published until 1843. These early catalogs did not contain descriptions of courses but merely listed the "courses of study" and the faculty. The very limited curriculum was that of a liberal arts college of that era, with much emphasis on classical languages and also on mathematics. Until 1868, with one exception, the faculty were medical doctors and divided their time between teaching the natural sciences and medical subjects. The president had an LLD.

At the time the bill for the charter of the university passed the legislature, Columbia College, (not the present Columbia College) was made a branch of the university and was soon absorbed into this institution. One of their three faculty members was listed as a professor of chemistry.

From 1843 to 1860, in the descriptions of the course of instruction, chemistry along with the other sciences is variously listed for the first term of the junior class, both terms of the senior class, or the second and third terms of both the junior and senior class.

The two terms or sessions as they were called at that time were twenty one weeks at first and later were changed to three sessions of fourteen weeks. Apparently only one daily period during the week was devoted to the natural sciences, so one wonders how much material could be covered in one to three terms.

In 1843, Dr. E. H. Leffingwell, a medical doctor, was listed as professor of chemistry, mineralogy, geology, botany, natural history, and physiology. Except for 1849-50, he was associated with these sciences until 1852, but the subjects listed after his name varied somewhat from year to year.

According to E. F. Stephens' "History of the University of Missouri", Leffingwell, who graduated from Yale in 1822, was the first professor of chemistry. He had had considerable experience in teaching the physical sciences and in giving popular lectures in chemistry.

During 1845-1847, the catalogs mention lectures on natural philosophy (physics) and chemistry with the use of apparatus, or as stated later, with experimental illustrations. Classes were held in University Hall, finished in 1843. The columns were part of that building. The statement "Examinations will be publicly holden of all classes at the close of the session" first appeared at that time and is repeated in some subsequent catalogs.

In 1852, Leffingwell was replaced by George C. Swallow, who is listed as Professor of Chemistry, Mineralogy, Geology, Physiology and Anatomy. He had a Masters degree. He also was interested in agriculture. He resigned in 1852 to become the first State Geologist, but returned to the University in 1857 with his original title, which in 1860 became Professor of Natural Science and Agriculture. Later he became the first Professor of Agriculture and the first Dean of Agriculture. Many years later, Swallow Hall was named for him. In 1857, Chemistry and Cognate Branches is listed under Departments of Instruction, with the following comments: Dr. Locke (an M. D.) has exercises with the senior class. "While he relies to some extent on text books, he communicates the major part of his instruction by lectures accompanied by experiments. The laboratory is furnished with an extensive apparatus which enables the professor to render his lectures very complete and satisfactory."

Changes came about in 1859-60 and thereafter. After the legislature of that year had removed the Board of Curators and vacated the chairs of the faculty of the university, they appointed a new Board for the purpose of reorganizing the institution. Among the changes was the designation of the chairman of a department. Swallow had left, and J. G. Norwood, a M.D., was the Professor of Natural Science and Natural Philosophy. These subjects were taught in the junior year.

In 1861, we find that the first term of the junior year is devoted to physics and the second term entirely to inorganic chemistry. The latter is "taught by lecture, every principle is elucidated by experimental illustration, for which the apparatus belonging to the institution is very complete. Fownes "Chemistry" is the class book, with Gmelin's "Chemistry" and Abel and Bloxam's "Handbook of Chemistry" as books of reference.

In the senior year, there is "instruction in Organic Chemistry and Chemistry as Applied to Arts and Agriculture, Mineralogy and Geology, Natural History including the Principles of Zoology and Botany, together with Anatomy and Physiology".

The Civil War disrupted all of the University activities. Then in 1867-1869 we find chemistry in a Department of Physics and Natural Sciences, with this description: "All of the second semester of the Junior year is devoted to the chemistry of the non-metallic elements."

"The laboratory is very extensive and every effort is made to render the course of instruction in this branch equivalent to that given in the very best colleges in this country. The principles of the science are abundantly illustrated by experiments. The supply of reagents is ample and specimens of chemical products are nearly all that could be desired."

"Throughout the entire course, the application of chemistry to Agriculture, Manufacturing and Mechanical pursuits and to Pharmacy is constantly brought before the students in connection with each element and its compounds. Special attention is paid to Toxicology. Every mineral poison is studied, so far at least as to the tests for its presence and appropriate antidotes are concerned. This is valuable for those who intend to study Law or Medicine."

The Senior year is devoted during the first part of the session to the chemistry of the metallic elements and afterward to Natural History.

In 1869, we are still in the Department of Physics and Natural Science, with the following description: "The course of instruction is given to regular junior and senior classes together with such irregular studnets as may elect to pursue scientific studies in connection with English courses and to the exclusion of purely classical studies".

"The time devoted to each branch of science is as nearly as possible commensurate with its practical importance".

"The remainder of the first and all of the second semester of the junior year is devoted to the chemistry of the non metallic elements. The first part of the senior year is devoted to the chemistry of the metallic elements."

"The plan of instruction in elementary chemistry has been by lecture, combined with recitations from some "Manual" (or class book). Such a method exercises the memory of the pupil but gives him little or no work to do for himself. To remedy this, a small treatise "Experimental Exercises and Problems" has been prepared."

"Provision will be made by the professor of analytical chemistry to accomodate any number of students. All who enter will be required to furnish their own platinum and reagents."

The next year there is this added comment: "Each student is required to take notes of every lecture delivered to his class and write out in a suitable book during the evening as complete and accurate a report of the lecture and its illustrations as his abilities and knowledge of the subject will enable him to make. The book is handed in to the teacher who makes corrections and returns it to the students for study". By 1872, chemistry is in the Department of Natural Science where it is listed until 1876. The description of the curriculum is similar to ones of previous years, with a few additions such as this: "The courses are given in accordance with modern doctrine."

"Throughout the entire semester, the applications of chemistry to the arts, manufacturing pursuits, agriculture and pharmacy are constantly brought before the student in connection with each element and its compounds."

"The junior year is devoted to the study of the metals and their compounds, together with qualitative analysis and organic chemistry."

Prior to 1872, most of the classes had been taught in University Hall, the first classroom building of the campus. This structure, which was the same size as the center section of the present Jesse Hall, included the well known columns.

The Agricultural College was established in 1872. Swallow, whose main interests were agriculture as well as geology, was named Professor of Agriculture in 1871, and in his report to the President of the University, he states: "One of the first wants of an agricultural college is a laboratory for chemical analysis. Chemistry is the very grammar of natural science."

"The erection of a science building is the first step in our progress. It is to be after the laboratory of the Michigan Agricultural College but improved and enlarged. On the ground floor it will contain the chemistry laboratory both general and analytical, a lecture room and other necessary apurtenances."

"The towers, which are not designed to be costly, have purposes of indispensible use and will give to the building a fine and even imposing effect."

In another section of the catalog, we find that "chemistry first of all, is the foundation of all accurate knowledge - practical. There is nothing that challenges the intelligence of the industrial man that can be fully understood

without it. Soils, plants, animals, paints, dyes, fertilizers, all food, all nature are founded on chemical principles." "Next to chemistry for practical utility I would place the physiology of vegetables."

The building requested by Swallow was constructed during 1871-72 at a cost of $45,507.00 without equipment and was designated first as The Scientific Building, then the Agriculture Building and much later as Switzler Hall. Chemistry occupied the first floor, agriculture the second floor and the other sciences the third floor.

In 1873, there is this statement: "A Department of Analytical and Applied Chemistry is just opened in charge of Professor Paul Schweitzer who has had instruction and experience in the best laboratories of Europe and America. The Laboratory Hall is one of the best equipped and most complete in the country, and is adequate to the nicest and most delicate operations. Students preparing to become druggists and professors of chemistry will be received and afforded every advantage of scientific instruction and laboratory practices."

"It is intended that this laboratory shall be eminently a state institution affording the means and equipment for the analyses both qualitative and quantitative of water, minerals, clays, ores, and soils of this great mineral and agricultural state". "The professor will largely spend his time in the work and superintendence of the laboratory and in the execution of private and state analyses."

The laboratory facilities are described in some detail. "The lower floor of the Scientific Building is furnished in the most approved style, affording the students all of the means which science commands for acquiring a thorough knowledge of analytical chemistry, both qualitative and quantitative and offering facilities in chemistry not equaled anywhere else in the state. There is ample provition for ventilation, a very important item in the construction of a laboratory".

Qualitative analysis is taught by lecture and blackboard exercises and the student is required to repeat at his table in the laboratory all the experiments performed by the Professor. Then he is given a simple unknown. Finally he is able to determine the composition of the most complex and difficult mixtures. Use is made of the spectroscope as often as needed.

After written and experimental examinations, he passes on to quantitative analysis, where he analyzes coal, limestone, ores, etc. There is also a course in applied chemistry which includes such topics as candles, oils and lamps, glass, soaps, etc.

In 1874, the departments of the University were organized into divisions, the first one of which was designated "The College" with Natural Science as one of the departments with Norwood in charge. The course in science led to a B.S. degree. In the catalog, there are these statements: "Instruction is given to regular sophomore and junior classes and such irregular students as may desire to study physics and chemistry in lieu of some branch in regularly organized courses".

"The last half of the semester is devoted to the first lines of general chemistry, including chemical nomenclature, symbolic notation, stochiometry, affinity or chemism and chemical philosophy generally. In the first part of the course, great use is made of the blackboard in connection with a volume of problems especially prepared for the use of classes of this institution". Two pages of sample examinations in general chemistry are included.

The junior year is devoted to the study of metaloids, metals and their compounds, together with organic chemistry. Qualitative analysis will be given to members of the class qualified to receive it, by the professor of analytical chemistry.

By 1875, "Recently large and valuable accessions have been made to apparatus for illustration and experiments in physics, chemistry, etc. by purchase of rare and costly pieces so that for its extent it is hardly surpassed in the United States. The appointments in this respect would be regarded as honorable in any scientific institution in the world."

II. 1876 - 1894

Chemistry was listed in the Department of Natural Science until 1876, when the various departments within the University were organized under the general heading Schools of the University, with chemistry under the Academic Schools.

The chemistry courses, taught by Schweitzer, consisted of phenomenal chemistry, rational chemistry, and the laboratory. For convenience, a later and more detailed description of the content of the first two courses is given here.

1. Phenomenal Chemistry. This is an elementary course in chemistry following a suitable text book and consists mainly in recitations illustrated as far as practicable by experiments and diagrams. The writing of reactions, calculating of quantities by weights and volumes, determining changes of volumes of gasses through changes in temperature and pressure and establishing formulas upon proper physical facts, accompany the work throughout. The course is designed to be complete within itself and while giving the students the facts and formal principles of the science, to serve at the same time as an introduction to the study of rational chemistry, taught later. This course was required of all students except those in law.

2. Rational Chemistry. The course in rational chemistry is a continuation of phenomenal chemistry on a broader basis, illustrated by experiments and specimens, interspersed with occasional recitations, reviews and discussions; but while that is mainly descriptive of the phenomena presented to our senses, this is inductive leading to their explanation through modern philosophical thought and explanation. Toward the middle of the semester, selected topics from the domain of organic and applied chemistry are discussed."

During 1876-77, Schweitzer asked for "a permanent lecture room adapted for the purpose and within easy reach of the laboratory."

He said: "I am engaged in class work for two hours a day part of the year and three hours a day part of the year instructing in the laboratory personally. In addition to teaching, I have to handle about 6,000 pieces of equipment, of which I must keep account, and provide ahead for special chemicals needed by the students." "The apparatus belonging to the department of chemistry which was turned over to me by Norwood consisted of only two old gas holders and a dozen or more of bell jars and feet-glasses". "It will require thought and ingenuity to do justice to the subject with this means". There were 35 students in the course titled The Laboratory, 7 in applied chemistry and 14 in general chemistry.

There were no significant changes in the descriptions of the five chemistry courses for the next four years. The total enrollment increased from 56 in 1876-77 to 100 during 1879-80.

In 1881, a new course "Domestic Chemistry" was added. "A course of lectures on domestic chemistry to be delivered to students who intend to graduate into the girls' course in arts, will be given in the coming year. It is intended to teach the principles of household science, a right under-

standing of which determines so largely the health, comfort and happiness of the human family." Topics to be included were air, water, food, and cosmetics.

In 1881-82, there is an additional statement to the effect that: "The full course in qualitative analysis is required of all who propose in science, civil engineering and medicine" and in an abreviated form of all candidates for other degrees. There is a list of analyses to be carried out by students taking courses in science and civil engineering, plus six additional analyses for agriculture students.

The enrollments in the courses for that year were as follows:

102 in Phenomenal Chemistry	32 in Toxicology
69 in Rational Chemistry	71 in The Laboratory
2 in Domestic Chemistry	34 in Qualitative Analysis
5 in Agricultural Chemistry	25 in Qualitative Analysis
	12 in Quantitative Analysis

In the 1888-89 catalog, two new courses appear: Thermo Chemistry and Thermodynamics, offered by an assistant who had a Ph.D. degree. The text was in French "Thermodynamique et ses Applications". Calculus was required. By 1892, no students had registered for the courses and they were dropped.

In 1894, the chemistry courses were reorganized, most of the old names were dropped, and the courses were assigned the conventional titles as we now know them.

The chemistry quarters in the Agriculture Building (Switzler Hall) were over crowded, as Schweitzer noted: "One of the most important needs of a university is a separate building for a chemical laboratory, now so intimately associated with the Agriculture Department. This want arises not only from the inadequacy of the present accomodations to meet the increasing demands made upon this department, but also from the danger to the health of the students occupying the same building, arising from the noxious gases generated in the laboratory. This is a convenience provided in nearly every institution in the country where practical and analytical chemistry is made a part of the course."

In January of 1892, fire destroyed the main building of the University, where the columns now stand. In the following year, the legislature appropriated $250,000.00 for the construction of six buildings around the quandrangle

on the west campus, of which $204,651.00 was used in 1893-94. The sum for chemistry was $28,000.00, which did not include equipment.

These buildings housed law, chemistry, biology and geology, physics and engineering, manual training and the power plant. According to Calvert, the plans for these structures were selected from a book of plans for college buildings. This collection did not include one specifically designed for chemistry, so the architect did some adapting. Perhaps that is one reason for the ventilation problems. For example, there were two hoods with no opening into a ventilating shaft, and one shaft in a basement laboratory had been blocked off with masonry about a foot above the opening.

From the time Schweitzer came here in 1872 until 1891, he alone or with first one and later two assistants taught all of the chemistry courses. In 1891, the staff was increased to two professors and one instructor, in 1900 to two professors and two instructors. The number of professors remained at two until 1905, when Schlundt was advanced from instructor to assistant professor.

In those days, there were only two professorial ranks: assistant professor and professor. The rank of associate professor was added at a later date.

III. 1894 - 1910

Schweitzer left the chemistry department in 1893 to become Professor of Agricultural Chemistry and Dean of the College of Agriculture. He was replaced in 1894 by H. B. Gibson as professor of chemistry. That same year Sidney Calvert, an organic chemist, joined the staff as assistant professor.

Thus during 1894-95, the chemistry faculty included two professors and one instructor. Gibson died in October of 1895 and Schweitzer returned to help out in the department for the remainder of the year.

William G. Brown replaced Gibson in 1896 as professor of chemistry and apparently was the chairman of the department until 1910. In 1895-96, the department offered ten courses and the staff taught in which ever course they were needed. For example, Calvert is listed from time to time in chemical theory, qualitative and quantitative analysis, carbon compounds, history of chemistry, and general chemistry. One wonders how they decided on their teaching schedules.

Requirements for graduate degrees as we know them today were first officially formulated by the University faculty in 1892, with the broad requirement of one year of graduate study for a Masters degree and at least three years for a Ph.D.

The graduate program of the University was formally organized in 1896 as The Graduate Department, which became the Graduate School in 1911.

Graduate study in chemistry was first listed in the 1897-98 catalog in The Graduate Department, under Brown. The specified areas were History of Chemistry and Chemical Philosophy, Advanced Quantitative Analysis, Advanced Organic Chemistry and Physical Chemistry.

By 1900, some chemistry courses were designated for both undergraduates and graduates and some for graduates. Research was listed a course in the areas of inorganic, organic and physical chemistry, presumably under the direction of either Brown or Calvert.

The period 1900-1910 was one of gradual growth and expansion. A few courses were dropped and were replaced by new courses as needed to keep up with the times.

Calvert spent a sabbatical leave at the University of Freiburg during 1901-02. He and Brown comprised the chemistry faculty at the professorial level from 1896 until Schlundt, who came as an instructor in 1902, was advanced to assistant professor in 1905. Some of the instructors remained with the department for several years but were not advanced. There were a few teaching assistants.

James A. Gibson was added to the staff as an instructor in analytical chemistry in 1907. In 1912, he was advanced to assistant professor, then to professor in 1917 and remained with the department until 1919.

In 1908, the College of Arts and Science was reorganized by Divisions, with chemistry in the Division of Mathematical and Physical Sciences, where it remained until this system was abandoned in 1918. There was nothing in the catalogs to indicate who was the chairman of a department, but in chemistry it was likely that Brown acted in that capacity, perhaps until 1910.

By 1910, the department listed twenty nine courses, but there were still only three men of professorial rank, Brown, Calvert and Schlundt, until Gibson was advanced in 1912.

The first Masters degrees were awarded in 1909 to Merle Randall (Thesis: A Comparison of Some Standards of Radioactivity) with Schlundt, and Webster N. Jones (Thesis: Some Methylene Condensations) with Calvert. Randall subsequently received a Ph.D. from the University of California and became not only a well known physical chemist on their faculty, but as co-author of the widely used text book of thermodynamics by Lewis and Randall.

Jones received a Ph.D. from Harvard University, then taught until 1918. After military service, he went into industry until 1932 when he became Dean of the College of Engineering and Science, Carnegie Institute of Technology, until he retired in 1956. It was said that he was offered the presidency of the University of Missouri in 1935 to succeed President Williams.

IV. 1910 - 1938

In the Spring of 1910, Schlundt began to keep minutes of departmental meetings, which are a source of many interesting details. The records for 1916-1930 have been lost, except for 1925-1927, but are otherwise complete to date.

In April of 1910, there was an order by the Executive Board which provided for the reorganization of the Department of Chemistry. This order read as follows:

1. That no permanent head of the department or director of the laboratories be longer maintained, but that instead a more democratic organization of the chemistry faculty be established with the appointment annually by the Executive Board of the Board of Curators of a chairman of the chemistry faculty and a director of the chemical laboratories, the chemistry faculty to consist of all the professors and assistant professors in the department.

2. That from this date until September 1st, 1911, Professor Herman Schlundt be chairman of the chemistry faculty with the right to submit to the President and the Board the recommendations of that faculty, and with the approval of the majority of the faculty to organize the courses of study and assign work to the several professors and instructors in the department.

3. That from this date until September 1st, 1911, Professor Sidney Calvert be director of the chemical laboratories with the responsibility of ordering supplies and apparatus, in accordance with the wish of the chemistry faculty as expressed by a majority vote of that faculty.

4. That from this date on, the titles of Professors Calvert and Schlundt remain as heretofore, and that the title of Dr. W. G. Brown be Professor of Technical Chemistry.

The circumstances which led to this directive are not known.

In the University catalogs at that time and until recently, it was customary to place the name of the chairman of a department first in the list of faculty members, no matter how small the department. On this basis, up to 1910 Dr. Brown had been chairman since he came in 1896.

In spite of the 1910 directive, Schlundt was chairman of the department until his death in 1937, and Calvert was Director of the Laboratories until his retirement in 1939.

The faculty during 1910-1916 consisted of the above professors, and Gibson, an instructor who was later advanced to assistant professor, plus one to three instructors who apparently were on temporary appointments.

For the most part, the staff meetings were devoted to routine discussions of such topics as the purchase of chemicals which at that time were mostly imported from Germany, apparatus, scheduling of courses, and the hiring of assistants, etc. Occasionally, there were other problems, as indicated by this letter from the university librarian:

"I beg to inquire whether the chemical faculty are considering the matter of removing the chemical library from its present position. The room (on the first floor next to the northeast corner of the building) in which the books are stored is dirty and unattractive. In fact, it is such a dirty place that I cannot ask one of my young lady assistants to go there for the purpose of checking the books. It is also a damage to the books and is not a fit place for a man to sit down to study. Will you kindly ask your faculty whether they would consider the removal of the library to the main library or to some room on the second floor as we talked of a couple of years ago. I am not at all satisfied with the present arrangement."

This matter was left to the Director of the Laboratories for adjustment with the Librarian, who agreed that a room on the second floor of the chemistry building, was a suitable place for the library. Later this room was used both as the library and as the main office for the building until about 1940.

The increasing enrollments in chemistry courses were again exceeding the laboratory space available, and in September of 1910, additional desks were

needed for 46 students. Calvert and Trowbridge (Director of the Agriculture Experiment Station) were to work out details for space for these students in the new Agriculture Building (Waters Hall). During 1910-1911, the enrollment in chemistry courses averaged 425 students each semester.

Earlier, the staff had agreed to turn away students when the capacity of the laboratories was reached, but they concluded that finding space for them was necessary. Taking students to another building meant additional expenditures for apparatus from funds not authorized by the President. In October, they received $150.00 for the purchase of supplies for lockers in the Agriculture Building.

In 1911, the staff voted to ask to have a telephone installed in the building. It was located in the storeroom rather than in the departmental office to avoid usage by students. It remained there until the early 1930's when a surprising amount of red tape was required to secure permission to move it to the main office.

The courses in Technical Chemistry and Industrial Chemistry were reorganized. Both were taken mainly by engineering students and were the forerunners of a curriculum in chemical Engineering.

A course in advanced physical chemistry required a reading knowledge of French and German.

By June of 1911, Trowbridge had had second thoughts about having chemistry students in the Agriculture Building and cancelled the agreement of the previous Fall. Schlundt then discussed with Deans Mumford (Agriculture) and Jackson (Medicine) the possibility of securing desks in the Agronomy laboratories or in the medical building (McAlester Hall).

Other ideas to solve the space problem within the chemistry building were to place the analytical balances on tables in the first floor halls, and that the professors give up some of their personal office space. These suggestions were not implemented, but a partition was installed in the hall on second floor to form a room, which later was converted into a research laboratory, and still later into a chemistry library.

In September of 1911, Schlundt reported that he had negotiated an agreement for a large portion of a room on the third floor of the Veterinary Building (Eckles Hall), for which 72 lockers would be provided by November 1. The equipment and installation were paid for by a special grant of $909.00.

In the Fall of 1911, the staff discussed the desirability of extending the electrical wiring of the chemistry building to include all rooms and corridors. This would be expensive ($300.00) so it was agreed to wire only a balance room and that the corridor on second floor be lightened with a gas fixture. These gas lighting fixtures remained connected in all the laboratories and offices in the building until it was rehabilitated in the early 1940's.

In December of 1911, Schlundt, Calvert and Brown met with Trowbridge to discuss the possibility of allowing the chemistry department to use space in the new building (Schweitzer Hall) which was in the planning stage for Agricultural Chemistry.

After conferences with Trowbridge and an exchange of letters with President Hill during December and January, it was finally agreed that all of the work in general chemistry should be transferred to the new building, that most of the top floor should be given to the general laboratories and that space should be available for offices and balance rooms. In his letters to President Hill, Schlundt repeatedly emphasized our concern over the plan "to split our work which will result in a temporary division of the department," "which will militate against the unity and efficiency of the department." At that time, they could not forsee that this temporary division would last for fifty seven years!

In one of President Hill's letters in which he comments on the needs of both agricultural chemistry and chemistry, he states: "I think that in the future we are more likely to have chemistry virtually one department."

Schlundt pointed out that with our present rate of expansion, we would soon be calling again for additional space. He asks: "Should we not then make plans for a building which will house both agricultural chemistry and chemistry and that will permit growth of both departments and thus hasten the day when, as you hope, all chemistry will be in one department".

After a meeting with President Hill, Schlundt reported to the staff on January 20, 1912 that:

(1) The president recognized the serious import to our department that a temporary division will entail.

(2) Not enough money will be available for a building which will house both agricultural chemistry and chemistry.

(3) In answer to our request that the legislature be asked to make provision for an addition to be planned for the new building so that chemistry could be united, the President pointed out the pressing needs of other departments.

(4) President Hill plans to name the new building Schweitzer Hall.

(5) Dr. Schlundt again emphasized the gravity of a division of the chemistry department.

Later in the year, the staff considered the purchase of equipment for the laboratories on the second floor of Schweitzer Hall and the redistribution of space in the chemistry building.

The department asked for the appointment of two additional instructors for 1913-14, to take care of increasing enrollments. In that era, it was somewhat customary to hire new faculty members at the instructor level and in time to promote them to professorial rank if their abilities justified this.

One of these instructors was noteworthy, mainly because of some of his ideas for his future which came to the attention of President Hill. The President wrote to Schlundt concerning this man's plan to establish a quasi-correspondence college, but the records do not indicate whether or not Schlundt had prior knowledge of this activity.

He had sent out letters requesting contributions to his college on what was purported to be university stationary, with the label "Chemistry Department, University of Missouri". He had had letter heads of his own made for the purpose, but the paper and the style of printing were not the same as that furnished by the university.

President Hill had presented this matter to the Executive Committee of the Board and they first voted to dismiss him at once but finally agreed to discontinue his services at the end of the semester. "If, however, he keeps up his foolishness, his head will be in the basket the moment I get any evidence of his activity of this sort."

Calvert was absent on leave during 1913-14 for study at Oxford and his place was taken by Webster N. Jones. He was Calvert's first graduate student, who he had gone on for further study at Harvard.

General chemistry moved to the second floor of Schweitzer Hall during the summer of 1913, but rather unexpectedly the enrollment exceeded the desks available and a waiting list was established. This situation led to severe criticism by Hill of our apportionment of space in the two buildings.

He called this "bad management, serious mismanagement". We had allowed too much space in the old building and we should not have abandoned the laboratory in the veterinary building. He had hoped that the space in Schweitzer Hall would take care of our needs for the next six years at least, but this proved to be nine years. At that time, no seer would have predicted that sixty two years later the chemistry department would be sharing space in their new building with agricultural chemistry.

Schlundt very firmly replied in person and by letter that records on file in President Hill's office confirmed that every action taken by the chemistry faculty in this matter had been recommended to him and had received his approval. Apparently he convinced the President that there was no ground for charging us with poor management, but he (Hill) did not say so in words.

We had not received sufficient funds to stock all the desks we had anticipated we would need in Schweitzer Hall, and a possible basement laboratory in the old building had been declared unfit for instruction of large classes.

For some time, there had been a problem with the ventilating system in the chemistry building, caused in part by the interruption of the current for the electrical exhaust fans. This had been reported to E. E. Brown, the business manager for the university but there had been no action.

Calvert wrote again to Brown and sent a copy of the letter to the President: "Cannot something be done to improve the ventilation in the chemistry building? The electric current driving the fans drops repeatedly and at the most unexpected times. The consequence is that the condition of the atmosphere in some of the laboratories frequently becomes really deplorable. Occasionally in some of the rooms you can hardly see the length of the room and the students complain bitterly and with great justice. My information is that in the last two years seven men have been carried out unconscious - five last year and two this. A continuation of this state of affairs and a weak heart may cause grave complications for the University. Twice in the lecture room recently, I was almost knocked out myself from the back flow of chlorine gas coming from some other room. Someone may be setting free a very obnoxious gas in one room and have it delivered very unexpectedly into the working space of another hood, where men may be quite unconscious of any danger."

Brown replied on the 8th, that they would take up this matter shortly when they consider repairs for all the buildings. On the 13th, Calvert wrote

again, pointing out that he, (Brown) does not realize the pressing need for immediate relief, and that something should be done at once to remedy the situation. He also sent a copy of this letter to President Hill. There is no further mention of this ventilation problem, so one assumes that something was done about it.

In October of 1914, Schlundt outlined to Hill the needs of the department for the next biennial period. As usual, we greatly needed additional new equipment ($5,000.00) to provide for modern, up to date instruction in laboratory work and for lecture demonstrations, and $5,000.00 for the offices and research laboratories in Schweitzer Hall. Some of these needs had been presented in 1912.

He pointed out that once again we have very nearly the maximum number of students which our combined quarters in the chemistry building and in Schweitzer Hall will accomodate. This statement was repeated in the Spring of 1915.

An April 1915 report to President Hill included a list of publications by members of the chemistry department. Of the five papers, Schlundt was senior author on four of them and co-author on one. All were in his field of radioactivity and were in well known journals. Marden, an instructor, had a paper in press.

In August, an instructor asked for a leave of absence for 1915-16. The staff recommended Mary Violette Dover for a temporary appointment as instructor with the understanding that if her services were very satisfactory, she would be recommended for the first vacant instructorship. She accepted the appointment on that basis, and remained with the department until her death in 1934.

In that era, the instructors were mainly coordinators as they were needed in the various courses with the senior professors and also did laboratory teaching. For example, in the catalogs, Dover is listed with Marden or Brown in analytical chemistry or with Calvert in organic chemistry or Schlundt in general chemistry.

Beginning in 1919, Schlundt was in charge of the general chemistry sequence (numbered 1f and 2w) in the Fall and Winter semesters Dover was in charge of the first course in the Winter and continued it the following Fall.

In 1916, H. F. Still was appointed as instructor in chemistry. He had a Ph.D. from the University of Leipzig under Ostwald in physical chemistry

and had been teaching for 6 years at Princeton and 9 years at Pittsburgh Institute of Technology. He was in charge of the course in physical chemistry and had 12 hours of inorganic laboratory work.

In the spring of 1916, the increased cost of chemicals and apparatus was causing budget problems. The department suggested that there should be either a special appropriation or an increase of student laboratory fees or both.

The last entry in the departmental record book is dated May 16, 1917. There are notations in pencil in Calvert's handwriting about routine matters during the Fall or 1917. The story covering the period 1917 to 1930 is based mainly on the relatively few data available in the University catalogs of that period, from hearsay by various faculty members, and personal recollections of the author.

World War I disrupted departmental activities. Schlundt offered his services as a chemist to the government, but this was declined. Dover had a leave of absence to work for Hercules Powder Company. In the departmental file of grades for 1917-18, there are lists of students in six courses headed "National Service Grades", which totaled 102 students. Probably, these were special sections of the regular courses, for they have the regular course numbers.

After the war, enrollments in chemistry courses increased to the extent that by 1919, the combined space in the chemistry building and the second floor of Schweitzer Hall was inadequate.

Brown left in 1919, and from that time until 1926 when G. F. Breckenridge took over the analytical program as assistant professor, there was a succession of teachers of the courses in that area. He remained with the department until his retirement in 1961.

During 1920, the legislature was asked for funds for the construction of a chemistry building, but no data are readily available to indicate whether or not Schlundt made any effort to obtain funds for a building large enough to house all of the chemistry department.

The sum of $125,000.00 was voted for this purpose, and after the building was completed during the Fall of 1923, the general chemistry program was moved to the new quarters for the opening of the second semester in January of 1924. The building was eventually named Schlundt Hall. Analytical chemistry moved to the second floor of Schweitzer Hall, leaving organic chemistry and physical chemistry to occupy the old building until 1951, when physical chemistry moved to a new addition to Schlundt Hall.

During 1920-21, Schlundt spent a leave of absence at the Cavendish Laboratories in Cambridge, England, and Calvert was the department chairman.

There was a succession of appointments in physical chemistry until 1921 when Allen E. Stearn joined the faculty as assistant professor.

Herbert E. French joined the staff as instructor in 1920, with a directive from Schlundt to develop a course in qualitative organic analysis which had been introduced in some larger chemistry departments at that time. The first year, he taught a three hour service course in organic chemistry and also in the general chemistry program. The next year, he was advanced to assistant professor and devoted all his time to the service course and the new course.

Dorothy V. Nightingale joined the staff as instructor in organic chemistry in 1923 to become a permanent member of the faculty.

The first Ph.D. in chemistry was granted to Leonard W. Gaddum, a physical chemist, in 1924. Eight years later in 1932, James E. Wildish was the second graduate student to receive this degree, under Schlundt's supervision. Beginning in 1934, one or more of these degrees would be granted yearly with the exception of the war years.

In 1927, Schlundt convinced Dean McCaustland of the need to develop chemical engineering. This led to the appointment of James R. Lorah as assistant professor of Chemical Engineering. Lorah had both a Ph.D. in chemistry and B.S. in chemical engineering. He was a member of the engineering faculty but taught some analytical chemistry courses for a time.

The equipment which Lorah inherited from the past in technical chemistry and industrial chemistry consisted of an assortment of out dated apparatus and a student laboratory on the first floor of the chemistry building with desks of 1893 vintage. In the basement, he found the large vats and filter presses used by Schlundt's students in the extraction of uranium ores.

The old coal-fired assay furnaces which still worked were in the southeast corner of the basement. They were used mainly for lead, gold and silver analyses, although they could be used for other metals.

At that time, there was only Chemistry 141, Industrial Chemistry, and one course in Chemical Engineering listed in the university catalog. Course 141 was listed in the chemistry department offerings until 1935 when it was dropped.

After the uranium ore extraction project was abandoned, suitable engineering equipment was installed in the basement. When the Engineering Laboratories

Building was completed in 1936, the program was moved entirely to the new facility.

In the 1920s, the indications were that the chemistry department would grow steadily as university enrollment increased. The permanent faculty had increased from five in 1919-20 to seven in 1926 and remained at that figure until 1938.

With the appointment of Stearn in 1921 and Breckenridge in 1926, the staff had stabilized in the areas of physical chemistry and analytical chemistry. Usually, there were one or sometimes two instructors on temporary appointment who coordinated laboratory work and occasionally taught service courses.

A few new courses were added as there was need for them. Two graduate level courses, one in organic chemistry and one in physical chemistry, were added as the result of the graduate students' petitions for them.

As Director of the Chemical Laboratories, Calvert was responsible for the ordering of supplies for the department. During the 1920s, the University business manager checked all orders closely, and if he noted a chemical which he considered to be for research rather than for classes, he crossed it off and told Calvert to order it from the research fund. Perhaps the cost of a chemical was the basis for his judgement. At that time, a research fund was available by legislative appropriation which was distributed to the various departments.

During this same era, Calvert was also in charge of requests to the University librarian for books and periodicals. At times, faculty members suggested for student use, books for reference which were rather more advanced than the text which they were currently using. These titles were rejected by the librarian as merely text books, but naturally he did accept requests for obviously advanced reference works.

Then came the depression era. During this period, when expenditures for all departments throughout the university were pared extensively, the already rather limited amount of equipment for undergraduate courses and special equipment needed for graduate work and research was reduced to a bare minimum of common glassware and a few out moded pieces of electrical equipment.

As funds coming into the state treasury decreased, the governor withheld corresponding sums appropriated by the legislature for the university. Faculty salaries were reduced stepwise, with administrators taking a higher percentage

reduction. Whereever possible, vacancies were not filled and some staff members not on permanent appointment were not re-hired. No one was dismissed from the chemistry faculty.

By Board of Curators action on November 11, 1931, all students fees for laboratory courses were transferred to a general university fund to be used whereever the administration saw fit. The amount of money returned to the chemistry department for Expense and Equipment was hardly enough to maintain the minimum of apparatus and chemicals needed in the courses.

The total enrollment in chemistry courses (not including summer school) dropped from 700 in the Fall of 1929-30 to a low of 457 for the Fall of 1933-34.

In the Fall of 1932, the department had six teaching assistants. Schlundt's Radiological Research project supported several graduate students and a few undergraduates before it was phased out in the late 1930s.

In the Fall of 1933, Schlundt developed a severe case of encephalitis and was in the hospital much of the 1933-34 school year. At the time it was said that he had had the highest temperature a patient could have and survive. He did recover and returned to teaching in the Fall of 1934 but with reduced energy.

During 1933-1935, the federal Public Works Administration sponsored construction of public buildings to help reduce unemployment. Funds were appropriated to the states on a matching basis. There was some indication that the legislature would be willing to provide such funds for building purposes, so several University departments, chemistry among them, submitted requests for new buildings. President Middlebush applied for legislative approval for construction funds. The application was successful, but a chemistry building was not among those selected.

At this time, the federal government was also advancing funds through the Reconstruction Finance Corporation to finance the employment of needy people on public projects. Federal legislation made possible the employment of students on University projects not connected with teaching. To qualify, the student must need financial assistance to remain in school and do satisfactory work in their courses. The chemistry department was able to employ a number of these students for clerical work, storeroom work, some research assistance, and odd jobs. They earned an average of $15.00 a month.

Dover died in August of 1934 after a gall bladder operation. During 1934-35, the general chemistry courses were taught by Schlundt and one of the instructors who was a graduate student of Dover's.

Lloyd B. Thomas, an undergraduate physical chemist of Schlundt's radium group who had taken an A.B. in the department in 1930 and a Ph.D. from the University of Minnesota in 1935, joined the staff that year as an instructor. He became a permanent member of the faculty in physical chemistry.

In 1935, Dean Mumford of the College of Agriculture asked us to vacate two rooms which we were using on the second floor of Schweitzer Hall.

Early in 1936, the staff began to consider applications for a replacement for Dover. At a departmental meeting, Schlundt circulated a carbon copy of a letter which Dean Tisdel (Arts and Science) had sent to a number of well known chemistry departments in which he asked for applications for the position and listed the usual description of duties. This letter mentioned that Schlundt was approaching the retirement age, and the Dean hoped to hire an experienced man with both teaching and administrative ability, who could become chairman of the department when Schlundt retired.

In April, the staff voted to send to the Dean the names of three chemists as desirable applicants for the position, with Henry Bent first on the list. He had been teaching at Harvard for ten years and had been assistant professor there during 1932-36.

In the Spring, Dean Tisdel and President Middlebush had visited several chemistry departments while interviewing applicants for vacancies in the College of Arts and Science. At Harvard, Dean Tisdel talked with Bent.

In May, he notified Schlundt that Bent had been appointed as associate professor of chemistry effective in the Fall of 1936.

In effect, he had replaced Dover and he had much of the responsibility for the general chemistry program after Schlundt had to give up teaching in September of 1936. After Schlundt's death in December 1937, Bent was appointed Dean of the Graduate School in 1938 but he continued to teach in the chemistry department. At that time, the Graduate Deanship was a part time appointment. which did not become full time until 1958.

V. 1939 - 1958

Allen E. Stearn became chairman of the chemistry department in 1939 and served in that capacity until 1958.

At the suggestion of Bent, four new graduate courses were added to departmental offerings in the Fall of 1936 in order to broaden the backgrounds of the graduate students. Two of these were taught by Bent and one by Thomas. The fourth course was at the senior and graduate level and was taught by Breckenridge.

With Calvert due to retire in 1939, Nightingale spent a sabbatical leave during 1938 at the University of Minnesota. Their chemistry department was noted for its outstanding organic program and she was looking for ways to improve Missouri's program, both in course content and in research equipment.

Calvert retired in 1939 and was replaced by Herbert E. Ungnade, an organic chemist with a Ph.D. from the University of Minnesota.

State finances had begun to improve as the country progressed out of the depression and the Administration was successful in receiving grants for student employment and for buildings. They had placed the rejuvenation of the chemistry laboratories and equipment and especially the rehabilitation of the 1893 chemistry building high on the list.

During 1938-39, a special fund was set up for the purchase of laboratory equipment for all undergraduate chemistry courses and for faculty and student research.

Plaster falling from the ceiling, crumbling wall plaster and peeling paint on the grimy walls in the old chemistry building, led to a careful and detailed inspection of the building. Not only was the wire mesh supporting the plastered ceilings rusting out, but the ancient and crumbling rubber and cotton 1893 insulation of the electrical wiring was a serious fire hazzard.

During 1939-40, funds were set up for the complete renovation of the building, from the rotting wooden flooring in portions of the basement on up to the 20 foot ceilings on the second floor. The entire building was rewired, the old ceilings were torn out and replaced, crumbling plaster on the walls was scraped off, the walls and ceilings were re-plastered and repainted. Perhaps the interior had been repainted once before, prior to 1920.

The new benches were on order for all of the laboratories and the workmen had removed much of the 1893 vintage furniture, when word came in 1941 that delivery of benches and equipment had been delayed indefinitely because of the war effort. Suddenly, some months later, we were notified that the desks would be shipped immediately if we would accept them. The purchasing agent

acted promptly, the desks came and were quickly installed. They were left in the building when the organic division moved into the new building during the summer of 1972.

In 1940, the American Chemical Society announced plans for the certification of chemistry majors who completed specified course requirements, which added up to more hours of credit in a given field than the regulations of the College of Arts and Science permitted at that time.

The Chemistry Department was able to persuade the Curriculum Committee that it was in the best interests of the chemistry majors to be certified by the American Chemical Society and in 1941 we were permitted to offer the degree of Bachelor of Science in Chemistry with a program which met the Society's requirements.

In the Fall of 1941, the University enrollment was 5,212 with 1,193 students in chemistry courses and 22 in 490 Research. After Pearl Harbor on December 7, 1941, enrollments dropped rapidly throughout the University to about 1,500 during 1943-44.

Departmental activities were again disrupted. Earl A. Long, a physical chemist who had joined the staff in 1939, was called to the Manhattan Project in 1942 and remained with that organization until shortly after the close of the war when he accepted an appointment at the University of Chicago. Nightingale and Thomas devoted much of their time to government projects, for which Bent and French were principal investigators. They were assisted by two postdoctorals and graduate students in physical chemistry and organic chemistry.

The university was selected for participation in the Army Specialized Training Program (A.S.T.P.) in June of 1943. The enrollment in special chemistry courses for that program peaked in the Fall of 1943 with 865 students plus 350 students in the regular chemistry courses. Before this program was phased out entirely during the summer of 1944, a total of 2,143 of these students had been enrolled in chemistry.

During the war years 1943-45, the general chemistry courses were taught at times by Bent and Thomas and by several college teachers who happened to be available. One of the latter was Julia Abbott who came in 1944 and remained in the general chemistry program until she retired in 1971.

Beginning in the Fall of 1945, enrollments increased rapidly as the returning veterans resumed or started college education, from over 5000 in

1946-47 to 11,452 in 1947-48. This latter figure was nearly double the 1941 figure. Chemistry facilities were badly over crowded with a maximum of 2,118 students in the Fall of 1946 and 2,009 in the Fall of 1947, with 40 graduate students enrolled in 490 research during the winter semester of 1948.

Classes were held at night, with the students' equipment stored in temporary lockers constructed in the halls of the chemistry building. The students carried their apparatus into the laboratories as needed.

The renovation of the chemistry building during the war had made available desk space for 26 graduate students in the research laboratories but they soon were filled. About half of the south laboratory on the second floor was partitioned off with wire netting to create additional space for the research students.

Nightingale spent 1946-47 at the University of California at Los Angeles. French died in the Spring of 1948 and was replaced by Norman Rabjohn. Ungnade left the department in the summer of 1948 and was replaced by Wesley J. Dale the following year.

During 1948-1949, the staff spent many hours discussing the requirements for graduates degrees, both the Masters and the Ph.D. They had experimented with various proceedures for conducting the oral Masters examination and the preliminary and the final oral examinations for the Ph.D., most of which left much to be desired. Finally, they agreed on a series of regulations which were followed reasonably well until into the 1960s. Later, in 1968, the organic, inorganic and analytical staffs adopted the cumulative system of written examinations to be taken prior to the oral doctoral comprehensive examination.

By the Fall of 1950, the University enrollment had returned to normal after most of the veterans had graduated, with 1,003 students in chemistry courses as compared with 1,193 in the Fall of 1941. Before long, however, enrollments began to increase again as more high school graduates went to college, and more seniors went on to graduate school.

The chemistry department had been pressuring the administration for years to ask the legislature for funds to construct an addition to Schlundt Hall large enough to house the entire second floor of Schweitzer Hall for their own increasing enrollments.

When Rabjohn had joined the faculty in 1948, the secretary of the Board of Curators at that time told him that a new building for chemistry was among

those at the top of the list of requests to be submitted to the legislature. Each biennium, we were near the top, but when the final building needs were submitted to the legislature, we were not at the top. The reason given for this lack of success was that departments which were placed ahead of chemistry were very badly over crowded and needed new quarters more than we did.

From the point of view of usable space, that was probably true, but what the Administration did not want to see or wouldn't admit, was the adverse effect of the geographical division of the department in separate buildings on the east and west campus. One of these buildings was of 1893 vintage, the equipment in Schlundt Hall was installed in 1924, and the facilities for analytical chemistry were of the 1915 era. The geographic division, in effect, had led to three small sub-departments with diverse interest and antiquated facilities.

In 1950, a $900,000.00 appropriation was at the top of the list, but in the end, when the legislative committees and the governor balanced anticipated state expenditures against probable income, the sum voted for an addition to Schlundt Hall was cut in half to $450,000.00.

Within the department, there was some sentiment for declining half of a building, since it would obviously furnish only temporary relief from overcrowding and leave us with antiquated space and furnishings. On the other hand, there was the feeling that half a building was better than none, and the appropriation was accepted with regret.

It was apparent that a building to be constructed for $450,000.00 would not furnish adequate space for all of the students in both organic chemistry and physical chemistry, and it would not allow for future expansion in those fields. The space would house physical chemistry very well, with perhaps some laboratory space for qualitative analysis. In the end, however, the addition to Schlundt Hall was designed entirely for physical chemistry, with Dr. Thomas in charge of the planning.

The addition was completed in 1951, and Dean Ellis stated that chemistry was the best housed department in the College of Arts and Science. It was predicted that "in a few years, the chemistry department will be under one roof. Schlundt Hall and Schweitzer Hall are growing together". The "few years" proved to be twenty one years.

For years, Calvert and department chairmen had written to the appropriate officials emphasizing the need for an adequate number of fire extinguishers

other than the small Pyrene models. They also pointed out the need for fire escapes from the building.

One night in 1949, an ether fire in a basement laboratory could not be controlled and one of the graduate students called the fire department. Some one also called Cowan, an influential official in the business office, and Stearn who was the department chairman at the time. There was little damage but an adequate supply of carbon dioxide fire extinguishers were installed before long.

The west front door was the only readily usable exit from the building. Visiting chemists and new faculty members pointed out that this would be serious in the event of a big fire in the basement, especially during class hours. The 1949 fire furnished a realistic example of this possibility and apparently catalyzed the superintendent of buildings and grounds to order fire escapes installed.

In 1951, the west 7 feet of the two offices on the north end of the building were partitioned off to extend the halls, and fire doors leading to metal fire escapes were installed at the north ends of the halls on both floors.

The wooden stairs from the basement to the second floor had been replaced by concrete stairs and a new door was installed at the ground level landing of the stairway on the east side. After 57 years, the building had reasonably adequate fire escapes.

There was a story, probably true, that the Columbia fire department had devised a disaster plan for use in the event of a big fire in the chemistry building. The combination of chemicals in the basement, the wooden flooring and a typical attic storage room could lead to a holocaust. It happened that whenever a blaze started, some one was around to quench it or call the fire department.

In 1956, Governor Donnelly recommended a state bond issue for the construction of buildings for state institutions. The legislature approved of this proposal, which was widely promoted and adopted by a state referendum vote. Again, the chemistry department asked for a new building, and again this request was ignored.

VI. 1958 - 1972

In the Spring of 1958, Stearn announced that he was retiring as chairman

of the department, but would continue to teach his physical chemistry course.

The staff voted to ask the Dean to appoint Norman Rabjohn to be chairman of the department. He accepted the appointment with the understanding with the administration that the size of the chemistry faculty would be increased as rapidly as possible by one to three additions each year.

In the Fall of 1958, there were four additions to the staff which included R. Kent Murmann and Robert E. Harris. These appointments increased the faculty to eleven members in the professorial ranks, and two instructors one of whom was permanent - a total of thirteen.

At the Fall 1958 meeting of the American Chemical Society, it was announced that Dorothy Nightingale was the nominee for the Garvan Medal which recognizes distinguished service to chemistry by women chemists. She received the award the following Spring.

In 1959, Rabjohn began pressuring the Administration to ask again for an appropriation for an addition to Schlundt Hall which would house the entire department. The response was the usual one: other departments are more crowded than chemistry.

In 1961, Wesley J. Dale succeeded Rabjohn as chairman of the department. In January 1964, Dale left to serve in the NSF Office of Institutional Programs until September of 1966, when he went to the University of Missouri at Kansas City first as Graduate Dean and later as Provost.

After much study by the Administration and the Board of Curators and with legislative approval, the decision was made in 1963 to expand the university into a four campus system. The branches would be in Kansas City, St. Louis and Rolla. The Rolla campus was already a part of the University.

It was recognized by all concerned that this expansion would increase the demands for funds from the legislature, which was already reluctant to continue to support increasingly large budgets each year for higher education in Missouri. New buildings, new faculty and an administrative hirarchy would be required.

The chemistry faculty at Columbia surmised that there would be competition for teaching assistants and also for graduate students, especially from the St. Louis campus which had aspirations for an extensive graduate program. The University at Rolla and at Kansas City already had limited graduate programs in chemistry. At that time, salaries for teaching assistants in chemistry at Columbia were barely competetive with those of other universities in the area.

David E. Troutner was appointed chairman in February of 1964 and served in that capacity until September of 1966. During his chairmanship, the Administration authorized the department to invite a well known chemist from another university to visit and evaluate the department. This was done, but only one or two of the chemistry faculty saw the report. We fared so badly, so the story goes, that it was conveniently lost in the Administration files.

The one portion which was quoted and probably was very helpful in our campaign for a new building, was the severe criticism of the antiquated facilities of the 1893 chemistry building, especially the research laboratories, and the housing of the department in three widely separated buildings.

In 1966, Allan M. Cartter, vice president of the American Council on Education, released a report entitled "An Assessment of Quality in Graduate Education". The committee responsible for the evaluations of the departments of universities and colleges offering the Ph.D. degree listed them in order of excellence under the headings: outstanding, adequate, and barely adequate. It was a shock and a disappointment to the staff to find that the UMC chemistry department was not even listed as barely adequate. During the preceding eight years, there had been a considerable effort to up grade the department by the purchase of research equipment and by increasing the number of faculty members.

During this period, William H. Byler, retired senior vice president of the United States Radium Corporation, made gifts to the University Development Fund which will eventually make possible two distinguished Professorships. One of these will be the Herman Schlundt Distinguished Professorship in physical chemistry. He had received a Ph.D. with Schlundt in 1937.

After Troutner finished his first term as chairman in 1966, Rabjohn was again appointed to that post. Again he pressured the Administration to ask for funds for the addition to Schlundt Hall. In the Spring of 1967, we were in the top bracket for new buildings with a request for a 2.5 million dollar appropriation hopefully to be supplemented by nearly that much in grants from federal agencies and state matching funds. For weeks, the chemistry appropriation was on the do pass list, then off the list, but finally by a close vote it remained on the list and at last we could look forward to having the department under one roof for the first time since 1912.

The next year, we were <u>firmly</u> told by the Administration that the building

was to be mainly a research facility - no large lecture rooms and a minimum of class rooms. Graduate enrollment in chemistry had been increasing and it was believed that this trend would continue.

In spite of this directive, some of the staff drew up a proposal which included a 350 seat lecture room, a 100 seat lecture room and three 40 seat class rooms. They presented their report to the chemistry staff and after it was turned down they handed it in to the Administration as a minority report but it was ignored.

A Building Committee consisting of Guyon (chairman), Kaiser, Kuntz and Murmann began to work with the architect to prepare a set of plans to present to the staff. The preliminary drawings did not show any exterior windows, partly because they would increase the size and cost of airconditioning equipment and also the cost of the building. This drew such vigorous opposition from some staff members for a variety of reasons that finally they voted by a narrow margin to have some windows.

The committee held open meetings on several Saturday mornings during the year to give staff members an opportunity to offer suggestions or criticise as the plans evolved. By the Spring of 1969, applications for grants had been approved and plans were finalized for a $3,750,000.00 chemistry building which included a wing for a chemistry library. It had been necessary to modify the initial plans from time to time to stay within the funds available.

The Board of Curators accepted the final plans in the Fall of 1969, bids were accepted, contracts were let, and early in the Spring of 1970, construction was actually under way. The total expenditures for the building and special equipment was finally close to $4,250,000.00.

During the construction period, 1970-1972, graduate enrollment in chemistry at UMC began to decline as it had in other universities. The Administration was aware of this trend and we were firmly told that we would have to share with other departments space which we did not need. There was even the thought that the wing planned for a branch chemistry library would be used for non academic offices.

Then there was yet another development. On December 14, 1971, President C. Brice Ratchford submitted to the M.U. Academic Planning Council, a comprehensive plan for the reorganization of all of the University programs within the four campus system. The controversial plan became famous as "Role and Scope" from one of the section headings. It included the elimination of some

duplicate programs on the four campuses, especially those for doctoral degrees which are the most expensive.

Among the drastic changes envisioned was the removal of the doctoral programs in the Physical Sciences from the Columbia campus to the St. Louis campus. The undergraduate and Masters degree programs would be unchanged on all four campuses.

Opposition from the Columbia faculty of all of the affected departments was rapid and vigorous, and the response from the other campuses was not entirely enthusiastic. Ratchford asked for comments and suggestions and he was deluged. There were vigorous protests, not only from the faculty, but from graduate students, alumni, legislators, and the curators. He said that the mail was about 50-50. Comentators in the press surmised that his motives were political, since the metropolitan areas would soon control the legislature.

Finally, he did modify his proposals, and so far as chemistry is concerned, each campus may have a doctoral program in the field. However, the final 12-page document released in 1973, closed with the statement that each doctoral program shall be reviewed by the end of 1975. Insights from this evaluation shall be reflected in program adjustments and in appropriate changes in the campus and the University's academic plan.

During the Role and Scope controversy, the Administration announced that all University programs on all four campuses were to be evaluated by outside teams. The team for the evaluation of the four chemistry departments consisted of an analytical chemist and an organic chemist, both well established and well known in their university chemistry departments. They visited the campus in March, 1971.

For background, a concise history of the department was prepared for them, which emphasized progress during the preceding seven or more years. Portions of this summary follow.

Beginning in 1958, changes in the University Administration plus pressure by the chairman, Rabjohn, and supported by the staff resulted in the gradual expansion of the permanent chemistry faculty from 10 in 1957 to 23 in 1970. The number of teaching assistants had also increased as University enrollments climbed.

The Expense and Equipment allotment gradually increased to $106,000.00 in 1969. Applications to various federal granting agencies such as NSF, NIH and

HEW for equipment for the improvement of undergraduate instruction and graduate research were generally successful. Some of these grants were matched from University funds, so the amount of departmental special equipment, especially research instruments, had increased notably.

Faculty members could apply to the University Research Council for funds for the purchase of equipment for their research. In the 1960s and following years, the Council received funds for faculty summer research fellowships.

In the 1960s, the Administration had also set up a special fund from which new faculty members could purchase equipment not available in the department, which they needed for their research program. These grants were as high as $15,000.00 for each of two incoming faculty members.

When the NDEA and NSF Trainee programs for graduate study were announced, the department applied for these awards and had a maximum of nine of these fellowships operative in 1967.

After World War II and up to the early 1960s, a number of agencies and industrial firms had made grants from time to time to the department for graduate student fellowships. Among these were The Research Corporation and The Petroleum Research Fund. The firms were the DuPont Company, Eastman Kodak Company, Gulf Oil Company, The Proctor and Gamble Company, McNeil Laboratories, Phillips Petroleum Company, Texas Eastman Company and Shell Oil Company. There was also a grant from the Monsanto Company for a fellowship and miscellaneous uses, and a gift from a St. Louis man for summer research fellowships for graduate students. A number of our graduate alumni were employed by most of the firms which made these grants.

During the period 1964 through 1970 these grants of all types totaled $950,556.00:

Federal Grants	Non-Federal Grants	Federal Fellowships	University Funds	Industrial Fellowships
$400,485	$93,020	$155,670	$251,211	$50,170

The 5-page report by the team was handed in in May and was a fair and realistic evaluation of the shortcomings and strengths of the chemistry department. They recognized the severe handicap of past geographical separation of the department in three buildings, especially the isolation of the organic group in antiquated facilities. They felt that the new building would have an immense impact on the quality of the department.

The quality of the teaching was rated as high, partly as evidenced by the fact that the UMC chemistry majors have done well in major graduate schools. The procedures for the examination, evaluation and progress of graduate students were described as well conceived.

Among the shortcomings cited were too few faculty research grants and less than average productivity to be expected of a major university chemistry department. The department should have 8-10 postdoctoral research associates, but has only one. They note that it is not clear that the faculty has applied rigorous standards for tenure in the past.

They concluded that the quality of the department is adequate for graduate training for the MA and the Ph.D. degrees. "Taking all of the various factors into consideration, it is felt that the chemistry department at UMC now has the scope and quality to provide comprehensive graduate training. It has the potential to improve substantially within its present support level, if proper care is taken in making future appointments and provided the faculty is willing to make the necessary hard decisions. It is recommended that the graduate program in chemistry at UMC be continued".

The building was completed in the late Spring of 1972, with the staff moving in during the summer. The dedication ceremonies were held on November 2, 1972 in connection with the Midwest Regional Meeting of the American Chemical Society.

Several of our outstanding alumni and students participated in the program. Armon F. Yanders, Dean of the College of Arts and Science, and C. Brice Ratchford, President of the University were among the speakers. Dean Yanders presented David E. Troutner, Chairman of the department with a commemorative plaque.

In the afternoon, Professor Linus Pauling of Stanford University spoke to an overflow audience in Jesse Hall auditorium on the subject "Chemistry in Medicine". He presented many of his controversial ideas on the relationship between chemistry and medicine. He included his research on Vitamine C and its use in connection with the common cold.

At the banquet in the Union, Anna Jane Harrison of Mt. Holyoke College, one of our well known alumni and the first woman to receive a Ph.D. in chemistry, was the principal speaker. A reception followed and completed the day's activities.

Thus, after sixty frustrating years, 1912-1972, the department of chemistry was housed in one building, but while planning and construction were under way, it became apparent that graduate enrollment in chemistry had peaked in 1968-1969 at Missouri and elsewhere.

Surveys had been made throughout the University of space utilization and the needs of various departments. Finally it was decided that we would share the new building with Agricultural Chemistry, but in the meantime, this department and Biochemistry in the medical school were merged into a Department of Biochemistry. Their faculty is housed partly in the chemistry building and partly in both Schweitzer Hall and in the Medical Sciences building. If graduate enrollments increase even moderately in either or both departments, there will again be a problem of the distribution of space.

In December of 1973, Willieallen B. Fish retired after forty four years of service with the department and was awarded a 40-year service pin by Dean Yanders of the College of Arts and Science. She came to the department as a half time secretary in 1929. Before long, Calvert, who was business manager of the department added bookkeeping to her duties and through the years this became an increasingly large and responsible part of her work. Her title was changed from time to time as her responsibilities increased and at the time of her retirement she had been chief accounting clerk for several years, although she was still employed on a half time basis at her request.

In the 1971 evaluation report, it was noted that most faculty members apparently had not sought grant support. Perhaps this comment had a catalytic effect, for during the summer of 1975, Troutner sent to Chancellor Schooling a summary of the external support which the department had received since 1971.

During this three year period, eleven of our nineteen faculty members received major grants from agencies such as The Research Corporation, The National Science Foundation, The National Institute of Health, The Petroleum Research Foundation, Water Resources Research, The American Cancer Society, The Office of Naval Research, The Air Force, and the Department of Interior Pesticides Research Laboratory. These grants totaled about $473,026.

In addition, the department is participating in a joint grant of $64,000 for three years with the Environmental Trace Substances Center. We also have received a few thousand dollars from contributions and minor grants to the department and to students.

From these funds in 1975-76, the department will support six post-doctorates and five graduate research assistants. In addition, fourteen other graduate students were supported by grants during the summer of 1975. The total budgets for all of these grants include $40-50,000 per year for expense and equipment. This is half the amount which the University is presently providing to support the entire teaching and research program.

The success in attracting external support is notable in that currently only about one grant application in five is approved. This may be considered as an indication of the quality of the research of these faculty members.

In the 1971 report, the quality of our teaching was rated as high. This view has been further substantiated by the fact that during the last three years, two of our faculty members, John E. Bauman, Jr. and Edwin M. Kaiser have received the Alumni Association's most significant honor, the Faculty-Alumni Gold Medal. Bauman also received the American Oil Company's award for teaching. In 1974, Lloyd B. Thomas received the annual Sigma Xi Award for excellence in research. Stanley E. Manahan's text book "Environmental Chemistry" is in a second edition.

In 1975, four of the chemistry graduate students received a Graduate School Award of $50 each for outstanding performance as teaching assistants. Several of the students have received awards from national granting agencies.

The future of the doctoral program in chemistry is still somewhat clouded by the shadow of Role and Scope. In the 1973 approved version of this plan, it is stated that "each campus shall offer baccalaureate and Masters degrees in chemistry. "Each campus may be a participant in the doctoral program. At the time the report was released, it was noted by those concerned that "shall" may be considered as a directive, but that "may" can be construed as permission which may or may not be withdrawn.

In a section of the University of Missouri Academic Plan 1975-85 adopted by the Board of Curators in 1974, chemistry has been placed in Category III-A, "Degree programs or portions thereof which are candidates for reduction". It is further stated that "the plan calls for chemistry doctoral degree programs of focused scope on all four campuses". The continuance of four doctoral programs may depend upon a sufficient number of high quality applicants for admission". Currently, the number of graduate students in chemistry appears to have stabilized at about forty. What the future holds remains to be seen.

It is fitting to finish this history of the chemistry department to note that the old chemistry building has been remodeled for galleries and other facilities for the department of Art History and Archaeology at a total cost of nearly one million dollars. They state that this fine old structure of the 1890s, with its large and small rooms and high ceilings, is ideal for a Museum of Art and Archaeology. Perhaps it is appropriate that this venerable old building should be used for this purpose.

VII. WORLD WAR II PROJECTS IN THE CHEMISTRY DEPARTMENT

These projects were carried out under the auspices of the Office of Scientific Research and Development.

PHYSICAL CHEMISTRY

Several projects were under the direction of H.E. Bent. One was concerned with toxic gases, especially mustard gas, for which a device was developed to test clothing for residues without mutilating the garment. A method was developed for preparing mustard gas on a small scale in the laboratory. A field detector for this gas, developed mainly by L.B. Thomas, proved to be very sensitive.

Another project had to do with the vapor pressures of some twenty war gases used in the liquid form. Much of this work was done by Anna Jane Harrison.

Later, emphasis was shifted to the detection and analysis of war time smokes. A field kit accepted by Edgewood Arsenal was developed by Harrison and Irby Bunding to sample air from the field and then identify from one sample a small fraction of a milligram of any or all of approximately twenty smokes. A field lamp developed in this work could be used under difficult wind conditions. The last project completed by the end of the war was a laboratory test for DDT.

Others associated with this project included Elijah Swift, Earl A. Long, and R. J. Francel.

ORGANIC CHEMISTRY

The project in organic chemistry was concerned with the search for new antimalarial drugs for the Committee on Medical Research in the Office of Scientific Research and Development. This work was published in the Journal of the American Chemical Society and the Journal of Organic Chemistry.

H.E. French was the principal investigator, with Dorothy Nightingale in charge of the acenaphthene chemistry and H.E. Ungnade assisting with the long chain aliphatic polymethylenediamines.

They prepared a number of alpha-(dialkylaminoalkyl) acenaphthenemethanols, but testing showed that none of them were anymore useful as antimalarials than the ones already in use. Some synthetic work was done with similar compounds in the isoquinoline series, but this project was phased out by the close of the war.

The preparation and purification of the polymethylenediamines containing six, eight and ten carbons was more tedious than the acenaphthenemethanols.

Seven of them were finally obtained pure enough for testing, but they also were of no value as antimalarials.

Graduate students who assisted in the synthesis of intermediates for the project were Anna Ludsky, L. Eilers, J.E. Poe, E.F. Orwall, K. Sears and Nina C. Knight.

VIII. CHEMISTRY FACULTY 1975

	Joined Faculty
Lloyd B. Thomas	1935
Norman Rabjohn	1948
R. Kent Murmann	1958
Robert E. Harris	1958
John E. Bauman	1961
David E. Troutner	1961
Robert R. Kuntz	1962
Richard N. Loeppky	1964
Stanley E. Manahan	1965
Edwin M. Kaiser	1966
Elmer O. Schlemper	1966
Scott Searles, Jr.	1966
Hyunyong Kim	1967
Richard C. Thompson	1967
Anthony M. Dean	1970
Jerome W. O'Laughlin	1971
John P. McCormick	1972
C. Kay Fair	1974
John M. Malin	1974
G. Stephen Kelsey	1975

EMERITUS FACULTY 1975

	Retired
Allen E. Stearn	1958
Henry E. Bent	1971
Julia E. Abbott	1971
Dorothy V. Nightingale	1972

IX. DEPARTMENT CHAIRMEN SINCE 1910

Herman Schlundt	1910 - 1938
Allen E. Stearn	1939 - 1958
Norman Rabjohn	1958 - 1961
Wesley J. Dale	1961 - 1964
David E. Troutner	1964 - 1966
Norman Rabjohn	1966 - 1969
John C. Guyon	1969 - 1970
David E. Troutner	1970 -

X. RESUMES OF PAST FACULTY MEMBERS OF LONG SERVICE WITH THE CHEMISTRY DEPARTMENT

Paul Schweitzer
1873 - 1894

Paul Schweitzer, Ph.D. University of Berlin and University of Gottingen was appointed to the University faculty in 1873 as Professor of Analytical and Applied Chemistry. The catalog of that year lists a department with that title and there was some thought of developing this area into a School of Analytical and Applied Chemistry but it never materialized.

Schweitzer was the first faculty member to devote his full time to chemistry. He alone, first with assistants and later with one other professor, offered all of the chemistry courses until 1894 when he became acting Dean of the College of Agriculture. Schweitzer Hall was named for him in 1913.

His interests were mainly in the field of agricultural chemistry rather than pure chemistry, but in spite of this, he did much to develop the department to the stage it was when Calvert and W.G. Brown joined the staff. He undoubtedly aided in pressuring the Administration to ask for an appropriation for the first building to be devoted entirely to chemistry.

In spite of a heavy teaching schedule, he carried on his own research which led to numerous publications. A few of these papers are printed in the University catalogs of the period.

Sidney Calvert
1894 - 1939

Sidney Calvert came to the University in the Fall of 1894 as assistant professor of organic chemistry and remained with the department until he retired in 1939. He was born in England but his family moved to Canada where he attended Ontario Agricultural College 1884-1887. He received a B.S. degree from McGill University in 1892 and a Masters degree from Harvard in 1894. He was advanced to Professor in 1905.

Professor Calvert can best be described as a chemist who was also a scholar and a gentleman of the old school. He was courteous and considerate of all with whom he was associated. He read widely out side of chemistry in such areas as history and economics, with a special interest in the history of science, especially chemistry. For a few years he had offered a course in the history of chemistry.

He did not have a doctoral degree. A story was that he had almost finished the research for a doctorate at one of the German universities when some one published on the problem on which he was working.

He had a leave of absence in 1901-1902 to attend the University of Freiburg. While there, he was impressed with demonstrations of organic reactions by an assistant during the lectures. When he returned to the University, he used this system for some time but finally abandoned it. However, he did display an extensive collection of organic compounds representing the various homologous series as he lectured about them. They were placed on the lecture table and were usually passed around so that the students could see and smell them. Those who had organic chemistry under Calvert usually mention this collection and also his digressions into the history of chemistry from time to time.

He had much sympathy for students who found organic chemistry difficult, especially pre-medical students. He was concerned over the possibility that a grade lower than C would keep the student out of medical school.

In 1910, he had been appointed Director of the Laboratories, a title which he still held when he retired.

His second leave of absence was spent at Oxford, England in 1913-14. He was there when the war broke out in August of 1914, and his return was delayed until early October.

In 1921, Calvert agreed to act as cosponsor with Ray T. Dufford of the physics department a promising research project of his which needed an organic chemistry graduate student. This problem included measuring the emission spectra of the chemiluminescence of organomagneium halides. For her Masters thesis, the writer did the experimental work, which was a first in this area. After Dufford's five publications relative to the spectra attracted attention, Calvert continued the project with him and a few other graduate students, but with no spectacular results.

During 1909 to 1937, thirty graduate students did the research for their Masters theses under Calvert's direction, mainly on condensation reactions, but only three of them were published. He said that he planned eventually to write a series of papers on this work but he did not get around to doing it.

After his death in 1949, friends of his son, John Calvert, contributed toward a memorial to Professor Calvert. Because of his interest in the history of chemistry, the fund was used to purchase an English translation of the writing

of the alchemist Gerber (Djabir), "The Works of Gerber", which was printed in England in 1675. Gerber was a famous Arabian prince and philosopher. The book is in the rare book collection in the University Library.

William George Brown

1896 - 1919

The only data available for Brown are those which appear in the University catalogs:

B.S. University of Virginia 1877.

Professor of Chemistry, University of Tennessee 1877-83.

Student at Heidelberg 1880-81.

Instructor at the University of Virginia 1883-85.

Morgan Fellow, Harvard University 1884.

Professor of Chemistry and Physics South Carolina Military Academy 1885-86.

Professor of Chemistry, Washington and Lee University 1886-94.

Honorary Ph.D. University of North Carolina 1889.

Assistant Chemist, U.S.D.A., 1894-96.

Professor of Chemistry, University of Missouri 1896-1919.

As noted earlier, it is likely that he acted as chairman of the chemistry department until 1910.

He is listed in the catalogs of the 1890s as teaching courses in the history of chemistry, chemical philosophy, advanced quantitative anlaysis, advanced organic chemistry, physical chemistry and inorganic chemistry.

Later he offered courses in Industrial Chemistry and chemistry of the rare earths.

He resigned in 1919 to go into industry.

Herman Schlundt

1902 - 1937

Herman Schlundt, B.S., 1894; M.S. 1896; Ph.D. 1900, University of Wisconsin, joined the faculty in 1902 as an instructor in physical chemistry. He had attended the University of Leipzig 1899-1900, and later (1920-21) he spent a sabbatical leave of absence at the Cavendish Laboratories in Cambridge, England. He advanced rapidly to professor of chemistry and to the chairmanship of the department in 1910.

In 1915, Schlundt was offered the chairmanship of the chemistry department of Vanderbilt University. In declining it, he said that while our crowded conditions here and divided work in two buildings were disadvantages, yet if he

left here, progress in his research would be delayed. He notes that he had passed through a critical period in reorganizing our department, and he was currently reaping some of the benefits.

His research interests were mainly in the field of the radioactive elements. Under his direction, 27 graduate students received Masters degrees and 4 received Ph.Ds.

His investigations into human hazards in the industrial handling of radium salts led to a series of papers on the detection and estimation of radium in living persons, published in the American Journal of Roentgenology and Radium Therapy beginning in 1929. He had some sixty papers in the fields of radioactivity and physical chemistry.

He was an expert witness at trials concerning radium poisoning from such processes as the painting of watch dials with radioactive paints. During World War I he worked on the production of mesothorium from monazite sand for use as a substitute for radium.

Around 1922, he established a semi-commercial laboratory at the University of Missouri to extract and purify salts of the radioactive elements from ores obtained in the United States and abroad. The local newspapers referred to this as the Radiological Research Laboratory. It was supported by firms such as the Wellsbach Company, Lindsay Chemical Company, and the U.S. Radium Corporation.

Breckenridge was Schlundt's principal co-worker and directed many of the details connected with the fractional crystallization not only of salts of the radioactive elements, but also in the purification of rare earth salts which could be separated during the process. This laboratory was one of the few places where these salts could be obtained.

Schlundt initiated development work on phosporescent zinc sulfide for use in a spintharescope for detection and measurement of alpha particle emitting materials.

The Radiological Laboratory supported a number of graduate and undergraduate students who otherwise could not have remained in the University during the depression years of the 1930s. A number of the top administrators of the Radium Corporation of America received their training under Schlundt and Breckenridge. It is of interest that to our knowledge, none of the individuals who worked on these projects suffered ill effects.

He was one of the outstanding teachers on the University faculty and probably the most outstanding teacher of general chemistry the department has had. A colleague in the physics department described him as a master showman. He would usually ask one or two students to assist him with a lecture demonstration. Then, when a reaction took place with some vigor, the students in the class could believe that he was just as surprised as they were. They wouldn't guess how many times he had done that experiment. He lectured with an enthusiasm which was contagious.

He had the ability to learn quickly the names and faces of his students. Then when he met them in the hall or on the street, he could address them by name. He enjoyed young people.

As chairman of the department, he was progressive, vigorous, efficient and forceful. He took an interest in the progress of the young members of the faculty and did all that he could to encourage them. He was a member of a number of important University committees.

It was unusual for Schlundt's generation that he felt there should be one or two women on the permanent chemistry faculty. During 1919-1927 there were three women at the instructor level from time to time, who served as co-ordinators in general chemistry for a few years. Usually there were one or more women teaching assistants on the staff.

He contracted the virulent strain of St. Louis encephalitis during the outbreak of the disease in 1933. At the time, it was said that he had the highest temperature a patient could have and survive. He recovered and resumed teaching but not with the same vigor he had prior to his illness.

During 1935-36, deterioration gradually accelerated and in the Fall of 1936, he gave up teaching. However, he was able to come to the office and carry out the routine activities associated with the chairmanship until he entered the hospital in October of 1937. He died on December 30, 1937.

His civic interests included the Kiwanis Club and the Columbia Chapter of the Red Cross.

James A. Gibson

1907 - 1919

James A. Gibson, A.B., 1902, A.M. 1904 Harvard University, joined the chemistry faculty in 1907 as an instructor. He had advanced to professor by 1917.

He is listed in the catalogs and departmental records as teaching not only in his field, analytical chemistry, but in other courses as needed. He resigned in 1919 to go into industry.

Mary V. Dover

1915 - 1934

Mary Violette Dover, A.B. 1898, M.S. 1900 McGill University; Ph.D. University of Breslau Germany 1908, joined the chemistry faculty as instructor in 1915. At that time the appointment was to be temporary since she was taking the place of a staff member who was on leave of absence. She was told that if there was a vacancy and her services were very satisfactory, she would be retained.

Apparently her services were satisfactory. There was a vacancy the next year and she remained with the faculty until her death on August 8, 1934. She was associate professor at the time.

She was born in Peterborough, Ontario, Canada in 1874 and retained her Canadian citizenship until the 1920s when she became an American citizen.

She had taught at Mt. Holyoke College as instructor in chemistry from 1909 to 1915. Colleagues there said that she was miscast in the role of a teacher in a women's college. She did not really like to have women in her classes at the University nor did she like to have women teaching assistants.

She was a well known campus figure because of her manner of dress and her bearing. There is a good picture of her in the 1922 Savitar. She was perhaps about 5 ft. 4 inches in height and stout as well as stocky. She wore severely man-tailored suits and coats which were made from English woolens purchased in Canada and tailored there. These heavy materials enhanced her portly appearance. She wore long skirts, with flat heeled oxfords. With the suits, she wore man-tailored shirts and she carried her watch in a watch pocket in her suit skirt. Her hat was a manish soft brimed felt, usually black or grey. She wore her long hair coiled on her head. In the laboratory or in class, she wore a short white jacket.

Schlundt taught the first course of the general chemistry sequence in the Fall, and followed it with the second course in the Spring semester. Dover was in charge of the first course during the Spring semester and continued it the next Fall. She substituted for him when he was out of town and it was interesting to note the students' reaction the first time they saw her behind

the lecture table. She followed her lecture notes meticulously, in marked contrast to Schlundt's lively presentation. She did not offer a graduate course.

Her research interests were in the area of the physical properties of lubricating oils and heats of combustion. She took part in a cooperative research project in this field with the Engineering experiment station and they still have some of her equipment.

She did much experimental work herself and directed the research for two Masters theses and three Ph.D. theses. One of these former students told the writer that he enjoyed working for her. She instructed him carefully in the techniques he used while emphasizing the value of meticulous accuracy in taking and reporting data.

This type of research in addition to a rather austere manner and an air of aloofness may have in part led to a number of myths which were so firmly believed that Schlundt had difficulty in preventing the press from using them when she died.

Among the stories which circulated were these:
She invented ethyl gasoline and iso-vis.
Ethyl gasoline was named for her.
The Standard Oil Company gave her the Cadillac coupe, her second car.

A graduate student once asked her if the latter story were true and her amused reply was "I wish it were".

In August of 1934, the writer was visiting in New York and happened to look at a copy of the New York Times. To her surprise she saw on the obituary page the headline "Dr. Mary V. Dover, Oil Authority Dies". The article stated that she was famous for her petroleum studies which had won her an international reputation.

Schlundt was not responsible for the exaggerations. Perhaps they came from President Williams who is quoted as saying that "she won recognition as a teacher and in research not only at the University but among scientists throughout the United States and elsewhere. She was one of the outstanding members of the University faculty". If she could have read these statements, perhaps she would have smiled and said: "I wish they were true".

Her first car was Hupmobile coupe, which she traded for a Cadillac, one of the few in Columbia at the time. She kept it at a down town garage where the

employees kept it well polished.

She lived at the then Daniel Boone Hotel at 7th Street and Broadway where once a year she entertained with a buffet supper for her friends. She was a gracious hostess with a quiet sense of humor.

Her interests out side of chemistry included sponsoring the Cosmopolitan Club, the first campus organization for foreign students. She was a member of the American Association of University Women and the Episcopal Church.

She enjoyed the parades by University groups such as those for Homecoming and Farmers' Fair and in the Spring when the students in the various branches of Military Science had their formal parades on the west campus, she was usually standing in front of the chemistry building to watch them.

Herbert E. French
1920 - 1948

Herbert E. French, A.B., Morningside College, 1915; A.M., 1917, Ph.D. 1920, University of Illinois, joined the chemistry faculty as instructor in organic chemistry in 1920. He advanced gradually to professor in 1941. He spent a sabbatical leave of absence at the University of Illinois in 1937.

He directed the research for twenty six Masters theses and eleven Ph.D. theses, which resulted in twenty two publications. They include some phases of Grignard reagent chemistry, the reaction of secondary and tertiary alkyl halides with metallic hydroxides, and the reactions of some esters and anhydrides with ammonia and amines. His best known publications were from two theses on the use of alpha naphthylisocyanate as a reagent for the identication of alcohols and amines.

During World War II, he was the principal investigator for our anti-malarial project for the Office of Scientific Research and Development.

French probably enjoyed teaching more than directing research. As a person and as a teacher, he ranked in popularity with Schlundt and Breckenridge. His lectures were well organized and well presented with some humor.

He liked people and after the departmental office was moved to the room next to the west entrance to the building, he delighted in sitting behind the desk when the secretary wasn't there and talking with students or faculty who happened by. In fact, he seldom used his own office on second floor, bur preferred to stay in the main office.

He smiled and laughed readily. The smiling portrait which we have of him, made by J.E. Poe one of his students, is characteristic.

He replaced Schlundt on the University Junior College Accreditation Committee, a service which he thoroughly enjoyed because of the contacts with the colleges.

Another appointment which he enjoyed was that as chairman of the University Public Exercises Committee which he held for the last several years of his career. Planning the commencement program was the most interesting activity for which he had to arrange.

The most notable commencement program for which he was responsible was the one at which President Truman was to receive an honorary degree. The exercises were scheduled for the stadium, even though that morning the weather bureau predicted possible showers. Rather than disappoint the many visitors, the committee members decided to take a chance and not move to Brewer Field House. The dull clouds were threatening, so the program was speeded up but just as the conferring of the regular degrees began, a light rain came down. President Middlebush dismissed the audience and President Truman received his degree later from President Middlebush in the rotunda of Jesse Hall in the presence of some officials, office staffs and a few other people. French was understandably greatly chagrined that the committee had gambled on the weather and lost.

During the Fall of 1946, after he began to have increasingly severe headaches and difficulty with coordination, the medical diagnosis was a probable brain tumor. Surgery in St. Louis in February revealed that the tumor was malignant. After he was released from the hospital he remained at home and by September of 1947 he was able to resume teaching part time though he released all of his graduate students.

At the beginning of the Spring semester of 1948, he had to give up teaching. The day he left the building for the last time, his hearty laugh while he was visiting in the office became our final recollection of a colleague who perhaps realized we would not see him again

He passed on in May of 1948.

Allen E. Stearn

1921 - 1963

Allen E. Stearn, A.B., 1915, A.M., Stanford University; M.S., 1917, Ph.D., 1919, University of Illinois, joined the chemistry faculty for the winter semester of 1921 as assistant professor of physical chemistry. He advanced to

professor in 1938 and became chairman of the department in 1939 after Schlundt's death.

He spent a leave of absence at California Institute of Technology, 1924-1926. He was a Visiting Professor of Chemistry at Princeton University in 1932-33 and at the University of California in 1941-42. He was also employed during some summers as a chemist at the Mallinckrodt Chemical Works in St. Louis.

He was Acting Dean of the Graduate School during several summer sessions when Dean Bent was away. He was a member of several important University committees. He retired as chairman in 1958 and permanently in 1963.

Stearn is a man of wide cultural and scientific interests. He is a skilled pianist and organist and reads widely in the humanities as well as in the physical sciences. For several years after retirement, he was an assistant editor of the science section of a high school edition of the Encyclopedia Britannica.

Until 1927, he often taught analytical chemistry. After Breckenridge came in that year, Stearn's teaching was entirely in physical chemistry. Until about 1948, he offered the undergraduate major sequence of courses in that area and most of the senior level and graduate courses from time to time as there was a demand for them.

His wife, Esther W. Stearn, was an instructor in analytical chemistry during 1921-1925 and later she taught chemistry at Columbia College (then Christian College) for many years before retiring. She had a Masters degree from the University of Illinois.

She received a Ph.D. in medical bacteriology from the University of Missouri in 1927. Her work in this area led to cooperative research with her husband in physicochemical aspects of various biochemical transformations. Their twenty-seven joint publications in the appropriate journals beginning in 1923 include biophysical equilibria, stoichiometry in biochemical reactions, chemical behavior of living cells, etc.

At least eleven students did the research for their Masters degrees under Stearn's direction and there are at least seven Ph.D. theses for which he was the research director. These are largely in biophysical-chemical areas and led to twenty-five publications.

After his retirement in 1963, the Stearns moved to Chicago where they now live.

Dorothy V. Nightingale
1922 - 1972

Dorothy V. Nightingale, A.B. 1922, A.M. 1923, University of Missouri; Ph.D. University of Chicago, 1928, was associated with the chemistry department of the University of Missouri for fifty three years, first as an undergraduate 1919-1922 and as a graduate student 1922-1923.

Her first appointment to the University was as a grader in the German Department 1920-1921. In the Fall of 1922, she became a student assistant in organic chemistry and the Spring semester of 1923 she was appointed graduate assistant in chemistry. After she received her Masters degree, she was advanced to Instructor.

She advanced gradually to Professor in 1959, and was Director of Graduate Studies in Chemistry from 1968 until her retirement in 1972 as Emeritus Professor of Chemistry.

She spent leaves of absence for research and study at the University of Minnesota (1937) and at the University of California at Los Angeles (1946-47).

Nightingale directed the research for the theses of 24 Ph.D. students and 26 Masters students. Her principal research interests, other than her early work in chemiluminescence, have included the action of aluminum chloride on alkylbenzenes, the reactions of nitroparaffins with alicyclic ketones, and the reactions of azadispiroketones. These and other studies have resulted in 56 publications in scientific journals.

During World War II, she and others of the Organic Chemistry staff did research on the synthesis of potential anitmalarial compounds for the U.S. Office of Scientific Research and Development.

She was awarded the Garvan Medal by the American Chemical Society in 1959 for distinguished service to chemistry.

After her retirement, she returned to her former home in Colorado and is living permanently at Frasier Meadows Manor, a retirement home in Boulder, Colorado.

Gerald F. Breckenridge
1926 - 1961

Gerald F. Breckenridge, B.S. in E., 1918; Ch.E., 1921, University of Missouri; Ph.D. University of California, 1924, was an instructor in analytical chemistry in 1920-21. After he received his Ph.D. he taught at Park College, then rejoined the chemistry faculty in 1926 as assistant professor in analytical chemistry.

In addition to his teaching duties, he supervised Schlundt's radium project, which involved the extraction and separation by fractional crystallization of mixtures of salts of the radioactive elements from ore concentrates.

Breckenridge was a popular teacher, who took a warm, sympathetic, personal interest in students, either those in his classes or his advisees. From 1939 to 1949, he was the sole adviser for chemistry majors.

The analytical laboratories were open from approximately 8 A.M. to 5 P.M. daily, so that the students could fit their laboratory work into their schedules. Breckenridge was available to them most of the day, to discuss personal, financial or scholastic problems, or just to talk. They were a family to him. He had a fine sense of humor and a sympathetic understanding which helped him view their difficulties in a reasonable manner. He often gave these young people financial assistance.

His main interest was in teaching, but he directed the research for six Masters theses and two Ph.D. theses. He also aided in the direction of the thesis research of some of Schlundt's students.

He retired in 1961 and died a year later from a stroke.

Lloyd B. Thomas of the chemistry department felt that the many students who had benefited from their contacts with him might contribute to a memorial fund, the proceeds from which would be used for the benefit of future students. He prepared lists of those who had been in his classes or were his advisees and in 1963 with the assistance of the Alumni Association, he sent out many letters suggesting contributions for this purpose. In 1975, the G. F. Breckenridge Fund totaled $17,851.36.

Henry E. Bent
1936 - 1971

Henry E. Bent, A.B., Oberlin College, 1922; M.S., Northwestern University, 1923; Ph.D., University of California, 1926, joined the chemistry faculty in 1936 as associate professor in physical chemistry. He had been teaching at Harvard University for nine years.

He was in charge of the general chemistry program until 1958 and also offered two graduate courses until he retired in 1971.

Bent was appointed Graduate Dean in 1938, and at that time he was the youngest graduate dean in the country. His tenure of twenty eight years was the longest for that position in the history of the graduate school. In 1938-39, the appointment was part time since there were only 549 students enrolled in the

Graduate School in the winter semester of 1939. In 1958-59, the position became full time with an enrollment in the winter semester of 1194, which by 1966 had increased to 3428.

During World War II, he directed several projects at the University of Missouri for the National Defense Research Council which became the Office of Scientific Research and Development.

While Bent was in the graduate office, he was involved in professional activities outside the university. These included the following: Chairman, Commission of Scholars, State of Illinois Board of Higher Education; Consultant, U.S. Office of Education and the North Central Association of Schools and Colleges; Chairman of several visiting teams of the North Central Association. He spent a sabbatical leave of absence in Washington, D.C. as Chief of the Graduate Fellowship Section, Division of Higher Education, in the Department of Health, Education and Welfare.

He retired from the deanship in 1966 to devote all of his time to teaching Introduction to Chemistry, a terminal course for non majors. He and the department chairman were able to convince the Administration that there should be a capable man to prepare and arrange lecture demonstration equipment for the beginning courses in chemistry. The first two of these appointees were retired industrial chemists who enjoyed this work.

From his research program at Harvard, he published some forty three papers in the usual scientific journals. While in the graduate office, he published in education journals. He continued his research at the University of Missouri until he went into administration, directing the research for three Masters theses and three Ph.D. theses.

Bent retired from teaching in 1971 and lives in Columbia, Missouri.

Herbert E. Ungnade

1939 - 1948

Herbert E. Ungnade, B.S., 1933; M.S., 1934, Michigan State College; Ph.D., 1938, University of Minnesota, came to the chemistry department in 1939 as assistant professor of organic chemistry. He was from Germany and had had the equivalent of about two years of our college work when his family moved to Lansing, Michigan. He spoke English well with almost no accent and in many ways he was typically German.

At the University of Minnesota during 1938-39, he was the chief assistant of Professor Lee Irving Smith's graduate student research group for the synthesis

of vitamine E. This assignment led to some ten papers and two patents with Smith.

While at the University of Missouri, he directed the research for twelve Masters theses and eleven Ph.D. theses. During the war years, he was employed part time on the organic OSRD project and part time teaching.

Ungnade's interest in research was extensive, not so much to add to chemical knowledge but to have a long list of publications as rapidly as possible. He set a goal of 100 papers within a given number of years and planned a graduate student's research as well as his own to that end.

When he came to Missouri, he was appalled at the shabby appearance of the laboratories of the old chemistry building and at once he began to try to brighten up the place. When we received authorization in 1940 for the renovation of the building he was delighted to spend hours on plans for the remodeling and refurnishing the student laboratories and the purchase of research equipment.

As a teacher, Ungnade was methodical and thorough in both graduate and undergraduate courses and in the training of his research students. The students maintained that he started at one end of the long blackboard, rapidly talking and writing until the board was full, then starting over again with an eraser in one hand and chalk in the other until the end of the hour.

He left the university in 1948 to go to New Mexico Highlands University, and from there he finally went to the Los Alamos Laboratories where he remained until his death in a climbing accident in Colorado in 1966. According to an obituary in the October 1966 number of The Journal of Heterocyclic Chemistry, he had achieved his goal of 100 titles in his list of publications.

Julia E. Abbott
1944 - 1971

Julia Abbott, A.B., Hood College, 1926; M.A., Cornell University, 1927; M.S. Massachusetts State College, 1933, came to the chemistry department as instructor in chemistry in 1944. She had been teaching at Stephens College.

During her twenty seven years with the department, her work can best be described as an efficient coordinator of the general chemistry program. From time to time she was in complete charge of some of the lecture sections, but for the most part her duties were largely supervisory. This included supervising the graders and the teaching assistants, the preparation and administration of examinations, keeping records, and teaching laboratory sections on short notice if an assistant was absent. Her day was often far more than an eight hour

day.

She is currently (1975) living in Columbia.

Wesley J. Dale

1949 - 1964

Wesley J. Dale, B.S., Illinois 1943; Ph.D. 1949 Minnesota, joined the chemistry faculty in 1949 as Assistant Professor in Organic Chemistry. He advanced rapidly to professor in 1958, and became chairman of the department in 1961.

He was in the Government Synthetic Rubber Research program at the University of Minnesota during 1943-1946.

He directed the research for nine Masters theses and thirteen Ph.D. theses, mainly concerning the effect of nuclear substituents on reactions of a series of o-, m-, and p-substituted styrenes.

In January of 1964, Dale left on leave of absence to serve in the NSF Office of Institutional Programs until September 1966 when he went to the University of Missouri at Kansas City as graduate dean. In 1971, he was advanced to provost of that institution, a position he now holds (1975).

XI. GRADUATE DEGREES IN CHEMISTRY 1909 - 1975

The data from 1909 through 1959 are taken from the Graduate School's lists of Degrees granted for the years 1892-1948, 1949-1955, 1956-1960, 1961-1965. The data for 1965 to 1975 are from chemistry department records.

Year	A.M.	Ph.D.	Year	A.M.	Ph.D.
1909	2		1940	6	3
1910	2		1941	3	2
1911	2		1942	6	3
1912			1943	4	5
1913	2		1944	7	
1914	4		1945	1	
1915	5		1946		1
1916	1		1947	6	2
1917	2		1948	5	5
1918	3		1949	13	8
1919	1		1950	7	6
1920	3		1951	9	9
1921	3		1952	5	3
1922	4		1953	4	5
1923	5		1954	1	5
1924	2	1	1955	3	5
1925	5		1956	1	5
1926	5		1957	1	6
1927	6		1958		8
1928	5		1959	2	4
1929	6		1960	3	4
1930	12		1961	1	6
1931	4		1962	6	8
1932	10	1	1963	1	5
1933	9		1964	2	7
1934	5	2	1965	1	7
1935	12	3	1966	2	14
1936	3	5	1967	1	4
1937	7	5	1968	8	16
1938	1	1	1969	7	3
1939	4	1	1970	6	6

XI. GRADUATE DEGREES IN CHEMISTRY 1909 - 1975 CONT.

Year	A.M.	Ph.D.
1971	10	8
1972	6	8
1973	7	6
1974	7	2
1975	6	3

XII. GRADUATE STUDENTS IN CHEMISTRY 490 RESEARCH - WINTER SEMESTER 1918-1975

These data were obtained from departmental records. Lists prior to about 1940 are rather confusing due to the fact that the present 490 was 271, 272, 290, and research grades were often recorded on more than one sheet.

Year	Number of Students	Year	Number of Students
1918	2	1940	12
1919	5	1941	15
1920	5	1942	16
1921	7	1943	2
1922	9	1944	3
1923	9	1945	4
1924	11	1946	9
1925	7	1947	20
1926	4	1948	31
1927	7	1949	40
1928	9	1950	35
1929	4	1951	18
1930	9	1952	18
1931	14	1953	27
1932	8	1954	23
1933	12	1955	26
1934	12	1956	24
1935	10	1957	24
1936	9	1958	26
1937	7	1959	26
1938	12	1960	26
1939	12	1961	29

XII. GRADUATE STUDENTS IN CHEMISTRY 490 RESEARCH - WINTER SEMESTER 1918-1975 CONT.

Year	Number of Students
1962	29
1963	39
1964	41
1965	33
1966	42
1967	49
1968	53
1969	49
1970	45
1971	45
1972	39
1973	33
1974	29
1975	25

XIII. CHEMISTRY ENROLLMENT FOR THE FALL SEMESTER, 1918-1975

1918-1919	511	1937-1938	860
1919-1920	797	1938-1939	851
1920-1921	632	1939-1940	921
1921-1922	732	1940-1941	586
1922-1923	675	1941-1942	1,193
1923-1924	604	1942-1943	1,131
1924-1925	699	1943-1944	1,215
1925-1926	704	1944-1945	345
1926-1927	689	1945-1946	727
1927-1928	696	1946-1947	2,117
1928-1929	639	1947-1948	2,009
1929-1930	700	1948-1949	1,770
1930-1931	681	1949-1950	1,326
1931-1932	698	1950-1951	1,033
1932-1933	484	1951-1952	977
1933 1934	457	1952-1953	1,078
1934-1935	498	1953-1954	1,115
1935-1936	606	1954-1955	1,349
1936-1937	737	1955-1956	1,581

XIII. CHEMISTRY ENROLLMENT FOR THE FALL SEMESTER, 1918-1975 CONT'D.

1956-1957	1,605
1957-1958	1,547
1958-1959	1,529
1959-1960	1,347
1960-1961	1,410
1961-1962	1,475
1962-1963	1,750
1963-1964	1,869
1964-1965	1,979
1965-1966	1,953
1966-1967	2,064
1967-1968	2,047
1968-1969	2,027
1969-1970	1,613
1970-1971	1,760
1971-1972	1,881
1972-1973	1,837
1973-1974	2,133
1974-1975	2,151
1975-1976	2,137