

**A BRIEF HISTORY OF THE CHEMISTRY DEPARTMENT
OF BRIGHAM YOUNG UNIVERSITY
(Hugh Peterson)**

During the early years of the Brigham Young Academy, the programs for students were divided on the basis of student competence into the Primary or Preparatory, Intermediate, and Academic Divisions. The determination of the level of instruction of students was largely on the "readers" mastered and the mastery of processes in arithmetic; chemistry came in the Academic program. A director or sub-principal was placed in charge of each of these divisions.

The first chemistry course was taught by Principal Karl G. Maeser during the school year of 1879-80, with George Q. Coray as his laboratory (demonstration) assistant. The subject matter discussed included nitrogen, nitric acid, oxygen (demonstrated by Coray), theory of oxidation, hydrogen, etc.

Dr. Maeser kept a "Register of Studies" in which he entered the list of topics discussed in each week of the year in each course pursued in the Academy. This "Register of Studies" involved careful planning of courses by all teachers and kept the principal informed of the content and progress of all courses. He kept this Register in his own handwriting throughout his administration. The "Register of Studies" is kept in the B.Y.U. Archives and was used in the preparation of this report. The "Register" volumes give an indication of the high level of scholarship and the orderly and systematic work of Dr. Maeser.

The next year (1880-81) James E. Talmage, who was born in England, September 21, 1862, and who emigrated with his parents in 1876, and who had taught in the Preparatory and Intermediate departments after arriving here, was assigned to teach chemistry with the help of George Q. Coray. They had six students the first term (9 weeks) and five students during the second term. The text book used was Steele's Chemistry. The subject matter listed in the "Register" as discussed in the first term included allotropic forms of carbon, phosphorus, carbon dioxide, boron, silicon, potassium, sodium, alkalies, ammonia, alkaline earths. The second term included studies of zinc, copper, platinum, mercury, silver, gold, iron, and starch, fermentation, distillation, and organic radicals. The third term included studies of nitric acid, nitric oxide, nitrous oxide, nitrogen, carbon (demonstrated), water. Following is a quotation from the Contributor Vol. 2, 1880, page 241, a part of an article about Brigham Young Academy. "The Scientific Department, also, which has fallen somewhat behind in the notice of the committee, has, of late, been especially favored. A small room has been fitted up as a laboratory, and but recently, a handsome consignment of physical and chemical apparatus and material has been ordered. A good foundation for a cabinet, especially mineralogical, has been laid, besides which preparation for an herbarium are being made."

George Q. Coray was born in Provo in 1857, son of Howard and Martha Coray who came from Nauvoo, Illinois. Martha Coray was a member of the first Board of Trustees of the Brigham Young Academy. George Coray later studied for three years at Cornell University

after which he entered the newspaper business (Deseret News). From 1912 to 1929, he was a professor of economics and sociology at the University of Utah.

During 1881-2, James E. Talmage taught chemistry, physics, and geology. There was no student laboratory work, but demonstrations of some phenomena served as a substitute.

The Academy was housed in the Lewis building located on the northeast corner of the intersection of Third West and Center Streets in Provo. Downstairs, the rooms used were the east room, the west room, hall, the library, and principal's office combined; upstairs, the auditorium with a stage. A small chemistry laboratory was arranged underneath the stage floor and this laboratory (demonstration) space was usable only from 11:00 to 11:30, under the schedule arrangements existing.

Cost of Chemistry Department 1st part of 1882
from 355 B9 (Treasurer's Record)

p. 46 ⁶	Chemicals	
p. 47 ⁹	Chemical Scales	7.00
p. 48 ⁵	Chemical Expess	4.00
p. 54 ¹⁰	Chemicals	28.80
p. 54 ¹¹	Scientific Apparatus	90.95
p. 57 ⁸	Scientific Apparatus	5.00
p. 59 ⁴	Scientific Apparatus	10.00
p. 60 ⁷	Chemistry Apparatus	10.00
p. 62 ⁷	Chemistry Apparatus	15.00
p. 66 ⁷	Chemistry Apparatus	2.00

\$173--Chemistry and science budget ordered by J.E. Talmage (1882)

In 1882-4, James E. Talmage was on leave attending Lehigh University and Johns Hopkins University, and the chemistry course was given by Milton H. Hardy, who is credited by some with the organization of the Chemistry Department (see Hardy Biography). He taught six classes, including shorthand, civil government, phonetics and chemistry. He later attended New York University where he received the M.D. degree in 1885. His text in Chemistry was Steele's Chemistry, and the course contained studies of inorganic chemistry, water, carbon, sulfur, etc., and simple analytical chemistry as indicated in the "Register."

In 1883-4, the work in chemistry was taught by J.M. Tanner who was graduated from B.Y. Academy in 1878. He was later president of the Utah State Agricultural College 1896-1900 and also president of Brigham Young College in Logan. He was city surveyor of Provo and an effective missionary. He died in 1927.

On January 27, 1884, the Lewis building was destroyed by fire, which might have started in the chemistry laboratory. All of the school's equipment was lost, yet only one day of school was missed because of the fire. Housing for the classes was found in other building through a splendid spirit of cooperation of certain citizens of Provo.

After a period of study at Lehigh University and Johns Hopkins University, J.E. Talmage returned to the Academy in the fall of

1884 and resume chemistry instruction along with physics and geology. He was made Director of Laboratories and was also secretary of the faculty. He taught chemistry until 1889.

In the autumn of 1884, the Academy was established in the Z.C.M.I. warehouse located on University Avenue at Sixth South Street. Eight rooms upstairs and three rooms downstairs at the east end of the building were used, the west end of the building being retained for Z.C.M.I. business. The chemistry laboratory was downstairs. The furniture needed was built by students. A chemical balance was obtained which was an essential to the conduct of quantitative work. A Collegiate Department was now included as well as a normal department.

The estimated total student capacity of the new setup was about 400. The Academy was housed here about eight years. Tuition in the Academic Department was \$9.00.

The scientific laboratory in the Z.C.M.I. building was on the lower floor and fortunately contained an artesian well that gave a water supply. It also included a private office and apparatus room.

A journal called the "Academic Review" began publication in October of 1884 by the B.Y. Academy, with James E. Talmage as editor. It was devoted to science, literature, and art, and was directly sponsored by the Polysophical Society. This society was organized by Principal K.G. Maeser during the second half of the second year of the school with the aim to "supply to the students opportunities for public training and the means of obtaining useful incidental instructions."

In the (Oct. 1884) first issue of the Academic Review, p. 3, we read, "at the present an enlargement or addition to the laboratory is in contemplation to meet the demands of the unusually large and increasing scientific classes. An addition to the analytical apparatus is expected to arrive shortly and it is hoped at an early day to open a course of instruction in practical assaying." "The merits of the department are borne testimony by the numerous applications made upon it for analytical work and professional advice."

The Review for December 1884 (p. 23) reports that "a specimen of water from the Warm Springs, Spanish Fork Canyon, proved on examination to contain 413.72 grams of solid matter per gallon; 76.11 grams of sulfuric anhydride per gallon; and 145.95 grams of chlorine per gallon."

The rudiments of science were taught from the beginning of the Academy, and attendance in the courses was at first optional. Soon after the differentiation of the Normal Department, the pursuit of at least one scientific study during the year was obligation on all normal students, and every encouragement was offered for more extended study. "The scientific course was the first to be individualized from among the branches of the higher departments, and this was effected during the fifth academic year. (Academic Review Feb. 1885, p. 34). The lack of apparatus and materials for demonstrations was a difficulty, but a beginning was soon made by securing an ordinary school-set of chemicals. Later the Board purchased a fairly extensive supply of materials--for physics 4 terms, chemistry 4 terms, including experimental lectures, and

laboratory work in general chemistry, qualitative analysis and the metals for 3 terms and assaying, domestic and organic lectures in 4th term."

The course offering in 1886-7 included the following.

(1886-7--B.Y. Academy, Catalog--p. 8)

Courses in Science--Chemistry--(Two year's courses) Talmage.

The first year's course comprises lectures on general and analytical chemistry supplemented by practical laboratory work, material for which can be obtained by the students at cost. Instruction in medical chemistry are included herein. The second year's course is devoted to lectures and practical work in quantitative analysis, assaying and mineralogy. Text and Reference books: Avery's Complete Chemistry, Stoddard's Outlines of Qualitative Analysis, Fresenius' Quantitative Analysis, Ricketts Notes on Assaying. J. E. Talmage.

In 1887 Talmage was made a member of the Board of Trustees and had increased administrative assignments. He was later made head of the Latter-Day Saints University in Salt Lake City and from 1894 to 1897 he was president of the University of Utah, but retained geology professorship 1897 to 1911. He became a member of the Quorum of the Twelve Apostles in December, 1911.

Emil B. Isgren was made Director of the Physical and Chemical Laboratories after the departure of James E. Talmage in 1889, and had responsibility for instruction in the natural and physical sciences until 1893. The teacher of chemistry in 1889 through 1893 was George E. Phillips, who had as his assistant William E. Rydalch during 1892-3. Mr. Rydalch became the chemistry teacher in 1893 through 1895 when he took a leave of absence. He offered elementary chemistry followed by qualitative and quantitative analysis and an introduction to the carbon compounds. Mr. Rydalch's work came under the direction of Walter M. Wolf who supervised all natural sciences work from 1893 through 1897.

A New Home for the Academy

A new permanent home of the school was completed in 1891 and on January 4, 1892 the academy officially moved to the large building at Fifth North and Academy (University) Avenue now known as the Education Building. Dr. Maeser was made superintendent of all church schools, and was succeeded as principal by Benjamin H. Cluff. Degrees were now offered for four years of work (perhaps B.Pd degrees). Tuition for the academic department was set at \$6.00 per semester.

This building housed the Chemistry Department for about sixty years. Edwin S. Hinckley, B.S., U. of Michigan; D.B., Church Board of Education, taught the chemistry program during 1895-1896, in which year the circular (catalog) p. 31 shows a much expanded offering. The textbooks were published in the circular, and the level of work seems to be of college grade.

Chemistry A. E1. Inorganic

The metalloids are considered. Laboratory practice supplements textbook work. Shepherd's Chem. 5 hrs/week--first semester.

Chemistry B. The Metals-Qualitative Analysis

Open to students who have completed A. Shepherd's and K dzies. 5 hrs/week.

Chemistry C. Organic Chemistry-General Principles
Lectures and reviews. Carbon compounds. Quantitative analysis. Open to students who have completed B. Remsen's-Organic Chemistry (Appleton's)

Chemistry D. Theories and History.
Assaying of gold, silver, copper and lead ores. Open to students who have had C. Ricketts. 5 hrs/week. Lab fee must be deposited. Two hours of laboratory practice will entitle the student to one hour's credit.

Charles R. Fillerup was the chemistry teacher in the year 1896-1897 under the direction of Walter M. Wolf, A.B., D.B., after which both Wolf and Fillerup left the institution. He had been assistant teacher in science the previous year.

A great improvement in the chemistry department occurred in 1897-8 when \$1500 became available and was spent on chemistry laboratory equipment, and James L. Brown, B.S., U. of Mich., became the professor of chemistry. The new equipment purchased was for general chemistry, qualitative and quantitative analysis, organic chemistry and for assaying.

The catalog for 1901-2 shows that Professor Brown had the degrees of B.S., D.B., and that admission to the High School was limited to people over 14 years of age who had a suitable "certificate" or who could pass non-technical examinations in arithmetic, grammar, geography, reading, spelling, and penmanship. Students were admitted to the "college" who had finished three years in B.Y. Academy High School or equivalent. The chemistry offering included courses in general chemistry (5 hrs) (One year), qualitative analysis of bases and acid radicals and unknowns (One year), quantitative analysis (5 hrs) (One year), assaying of gold, silver and lead ores (3 hrs) (One year), organic chemistry (5 hrs) (One year) and chemical philosophy (3 hrs) (One year) all by Prof. Brown.

Professor Brown continued to conduct the chemistry program until 1902 when he became the director of Elementary Education, which assignment he held until 1921. He died in Sept. 1921.

During 1902-1903 according to the faculty minutes, the chemistry courses were conducted by Arthur E. Dalley who had the enrollments history listed: Chemistry A-10 students, Chemistry 1-5 students, Chemistry 2-4 students and Chemistry 4-6 students.

His name did not appear in the catalog for the year, so is appointment is assumed to have been a late and probably temporary one.

In 1903 a young man, who had been graduated from B.Y.A., 1897, previously with a B.Pd. degree and was this year graduated from Stanford University with an A.B. degree in chemistry, was appointed to the chemistry professorship in the Academy. His name was Charles Edward Maw. He was likely the first teacher of chemistry in the history of the Academy who had been trained in the subject to this extent of specialization. In his early years at B.Y.U. he was also an assistant to Prof. A.C. Lund in music.

Academy to University

There had been a college department in the Academy for some time before 1903, but to better represent the comprehensive character of its work and to encourage further expansion, the Board of Trustees on November 16, 1903 changed the name of the institution to Brigham Young University. This encouraged specialization in the faculty and expansion of the offerings.

During 1903-4 and a few years thereafter, the general chemistry course was a full year course open to high school students, and the college students in the subject were also placed in this class. The course schedule was three recitations and six hours of laboratory/week throughout the year. Text: Remsen's Brief Course in Chemistry.

The college level courses were:

1. Qualitative Analysis, 5 hrs. First or second semester.
Text: Medicini's Qualitative Analysis
2. Quantitative Analysis, Gravimetric and Volumetric Methods, 5 hrs. First or second semester.
Text: Talbot's Quantitative Analysis
3. Mineral Analysis, 5 hrs. First or second semester.
Text: Fresenius' Quantitative Analysis, Cairn's Quantitative Analysis
4. Wet Assaying
5. Assaying
6. Organic Chemistry
7. Philosophy of Chemistry, 3 hrs. Second semester.
8. Metallurgy, 5 hrs. Full year course.

After 1903-4, the courses in Philosophy of Chemistry and Metallurgy were dropped. The other courses were about the same for ten years.

In 1905-6, certain families undertook to sponsor the laboratories in various departments, and the Magleby family did this for chemistry.

The Magleby Laboratory of Chemistry, maintained by the Magleby family, was supplied by materials for demonstrations of the theories taught in the classroom; apparatus for elementary work, for qualitative and quantitative analysis and for special work in organic chemistry. Other families undertook to sponsor laboratories, such as the Holt Laboratory of Physics, and the Hinckley Laboratory of Natural Science.

In 1905-6, Dell D. Boyer was appointed assistant in chemistry with a special assignment in General Chemistry-the high school-college first course. This is the first indication found of a second member of the chemistry staff.

By 1913-14, the General Chemistry course had been made a college course, separate from the high school. The chemistry offering was:

1. General Chemistry, 3 lect, 2 two-hr labs/week. First semester. The non-metals.
2. General Chemistry, 3 lect, 2 two-hr labs/week. Second semester. The metals and elementary qualitative analysis.
Text: Morgan's Qualitative Analysis. Lab fee \$3.00.
3. Elementary Quantitative Analysis, 5 hrs cr, 2 lect, 8 hrs lab/week. First semester. Gravimetric and Volumetric.

4. Advanced Qualitative Analysis, 5 hrs cr, 1 lect, 8 hrs lab/week. Second semester. Minerals and complex cyanides.
5. Mineral Analysis, 5 hrs cr, 1 lect, 8 hrs lab/week. First or second semester.
6. Wet Assaying, 3 hrs cr, 1 lect, 6 hrs lab/week.
Text: Lows' Technical Methods of Ore Analysis
7. Assaying
8. Organic Chemistry, 5 hrs cr, 3 lect, 2 labs/week. First semester.
Texts: Cohen's Theoretical Organic Chemistry, Jones' Laboratory Manual
9. Water Analysis
10. Food Analysis
11. Urine Analysis
12. Physical Chemistry
13. Electrolytic Analysis
14. Independent Work in Mineral Analysis
15. Agricultural Chemistry
Text: Hopkins and Pettite
16. Physiological Chemistry
Prerequisite-General Chemistry, 3 hrs cr, 1 lect, 2 labs/week.

In 1914-1915, the offering listed in the catalog was the same as the above (1913-14). It shows Charles E. Maw with the M.A. degree and James A. Ollerton A.B., as instructor in chemistry.

In 1915-16, the course offering was the same. William T. Tew and J.t. Aydelotte were instructors or assistants, and both were included among the graduates of 1916. The course offering for 1916-17 was again the same.

The lectures were given in room 285 on the main floor of the Education Building and the laboratory work was done in the basement rooms. Hydrogen sulfide was generated by each individual student in qualitative analysis and used as a precipitating agent, the result being a considerable amount of the odorous gas diffused from the laboratory throughout the entire building with vigorous complaints and protests being uttered by many people. The chemistry supply room was located south of the large laboratory, and was reached by students going into the hallway and receiving materials through a window.

In 1917-18, the course offering was the same as in the preceding few years, except that an attempt was made to separate college students who entered Chemistry 1, General Chemistry, without a previous high school course in chemistry, from the ones who had high school chemistry. This applied only to the first semester, after which students took the same courses. The group having had high school chemistry had 2 lectures and 2 two-hour laboratory periods per week, while the other group had 3 lectures and 2 two-hour laboratory periods per week. This was the first year of American participation in World War I, and the college program was greatly hampered. No indication is given in the catalog as to whom or how many assistants Prof. Maw had this year. The tuition for college students this year was \$25.00, which included a subscription to the "White and Blue" student newspaper,

the lyceum numbers and student activities.

In 1918-1919, Professor Maw was still responsible for the instruction in high school chemistry, as well as for the whole college offering. Ross Bean was an assistant in chemistry. The college course offering was the same as in 1917-1918.

In 1919-1920, the school went into the quarter system, the school year being divided into three quarters. Chemistry 11, 12, and 13 each carried 4 hours of credit with 3 lectures and 2 two-hour laboratory periods per week. This course was for students not having had high school chemistry.

Chemistry 14, 15 and 16 was the sequence of courses for those having had high school chemistry, and it included elementary quantitative analysis, as did Chem. 13. Elementary quantitative analysis was a one-year course carrying 4 hours credit per quarter. The courses previously offered separately were now grouped together under special methods (a) water analysis, (b) food analysis, (c) electrolytic analysis, each 2 hours credit. The assistant in chemistry is blank in the catalog, and the overall offering was the same as formerly except as herein noted.

The offering was the same in 1920-21 and no assistant was named in the catalog.

On April 26, 1921, President George H. Brimhall retired as president and became president emeritus, and Franklin Stewart Harris, Ph.D., was made president, effective July 1, 1921. This was a great change for the University because of the vigor, insight, and training of the new president. He was trained in science and his influence was soon felt. A college of Arts and sciences, which included the Chemistry department, was organized. Dr. Martin P. Henderson was the first dean. Leadership Week was started in January, 1922. College of Applied Sciences was begun January 25, 1922, and the dean was M.C. Merrill. Carl J. Christensen and Arthur Bond were the assistants in chemistry. The student registration fee for college students was \$25.00 with an additional student activity fee of \$10.00. Thirty credit hours in a major field were required for graduation with twenty hours of credit in related fields, and a total of 183 credit hours of college credits.

The chemistry course offering remained the same as for several previous years, except that physical chemistry was not listed. It had been listed several times with the notation "not given this year."

A Graduate Division was organized in 1922-3 listing requirements for the Master's Degree. It was administered by a committee on graduate work.

Frank Y. Gates was the assistant in chemistry in 1922-3. He was a grandson of Brigham Young. The chemistry courses beginning with General Chemistry through Qualitative and Quantitative Analysis were scheduled to be taught by both Professor Maw and Mr. Gates. Two lectures and two laboratory period/week, 4 hours credit. In 1924, B.Y.U. was accredited by the National Association of Colleges and Universities. The Heber J. Grant Library was dedicated on October 16, 1925, and the University was accredited by the Association of American Colleges in 1926.

Graduate courses first were listed this year as follows:

103-Advanced Organic Chemistry-Organic preparation and organic analysis, 4 hours credit. Prof. Maw.

110-Research-Independent work in problems in inorganic, organic, and analytical chemistry, time and credit to be arranged. Prof. Maw.

During the year 1923-24, Professor Maw was on leave, studying at Stanford University, and the work of the Department was conducted by Mr. Gates, instructor in chemistry; Mr. Carl Christense, instructor in chemistry; and Mr. Stewart Williams, instructor in physics. The courses in organic chemistry were not given this year, so no graduate work was done.

The catalog for 1924-25 shows Charles E. Maw, Ph.D. for the first time; he, having been graduated from Stanford University in 1924 with this degree, added greatly to the prestige of the Chemistry Department. Mr. Gates and Mr. Williams were instructors. Physical chemistry was offered through two quarters with 2 lectures and 2 laboratory periods per week.

The course offerings were divided into lower division, upper division, and graduate, organic preparations and organic analysis being the graduate courses offering along with research.

During the first quarter of the 20th Century, Brigham Young University graduated fewer than two degreed chemistry majors per year. The department was a one to two man department.

In 1925-26, Mr. Gates was an instructor in chemistry, and Mr. Carl Christensen, M.A., was listed as instructor in physics and mathematics but was also listed under the chemistry heading. He taught the high school chemistry and physics and the college course in physical chemistry.

A chemistry seminar, giving one hour credit per quarter, was first offered. The total student enrollment in chemistry courses now reached almost 100. Mr. Loren C. Bryner was the head supply room man and proved to be an efficient and very promising young man.

In 1927, Mr. Gates, who had helped out in the Department of Physics and Mathematics as well as in chemistry, left the university to be an engineer for KSL radio station, and Mr. Carl J. Christensen left to engage in further graduate studies, leaving staff vacancies. Hugh W. Peterson, who had served as head of the Science Department at Provo Senior High School and teacher of chemistry since 1920, was invited to join the faculty as instructor in chemistry and physics. He had been graduated from B.Y.U. with an A.B. degree in 1916 and received an M.A. degree in 1928. His first assignment was to teach and direct practice teaching in chemistry and physics and a class in geometry. During the winter quarter he was assigned also a course in elementary general chemistry in the college program. Loren C. Bryner, B.S., 1928, and Myron N. Jorgensen, A.B., 1928, were assistants in chemistry and Mr. Delbert A. Greenwood, A.B., 1926, was an instructor in chemistry, all on a part-time basis while they pursued their graduate programs.

In 1928-1929 students not presenting high school credit in chemistry were enrolled in Chemistry I, Elementary General Chemistry, which was offered each quarter with three lectures and one laboratory period per week--4 hours credit--Peterson. He was

also assigned Chemistry 55--Training in Laboratory Methods in Chemistry--autumn and winter--2 hrs. credit. Due to the large number of courses offered in the Chemistry Department and the small staff, it was necessary to give considerable responsibility to the instructors and assistants, sometimes even a whole instructional program was assigned to an assistant. This weakened the Department evaluation among students and among other universities because of the lack of adequate background training. Professor Maw did well under these conditions and with very limited facilities (rooms and equipment and very limited budget).

In 1929-30 the same personnel carried on essentially the same program as last year with the same limitations and problems.

In 1930-31 Messieurs Greenwood, Bryner left the school by graduation, and Prof. Maw, and Instructors Peterson and Jorgensen and assistants Harold Calvin, Orville Polley and Harvey Millar constituted the chemistry staff. The Chemistry I (El. Gen. Chem.) course was expanded to two quarters and constituted a general college chemistry course--three lectures and two labs per week with Peterson as the teacher. The Principles of Chemistry course (Chem.) Maw and assistants consisted of one quarter of general chemistry, one quarter of mostly El. qualitative and one quarter of elementary quantitative analysis. In the upper division offering Advanced Qualitative and Quantitative analysis were offered with Chemistry 5 and 6 as prerequisites.

Physical Chemistry was offered by Mr. Jorgensen, but the text was too difficult for teacher and students, and the course was modified.

During the early 1930's, the Great Depression occurred and the general financial situation of the Church required a drop in the faculty then meager salaries of 12½% one year and another drop of an additional 10% the next year. Student finances were, of course, affected since employment was very difficult to obtain. In 1931-32, the Chemistry staff consisted of Professor Maw, Instructor Peterson, and assistants Orville Polley (A.B. 1931), Harold Calvin (A.B. 1931), Alva Johnsen (A.B. 1931), and John Wing. Peterson gave the (Chem. 1,2), Elementary General Chemistry, and Advanced Inorganic Chem. (151, 152, 51, 52) the Elementary Physical Chemistry (82, 83) in addition to the high school Chemistry and Physics for practice teachers. To this load was added the graduate course in colloid chemistry. Professor Maw also had a very excessive load. Summer sessions teaching was paid for at the rate of \$100 to \$150 for the summer, depending on rank, and regardless of the duration of instruction, whether one or two terms. The same members of the staff continued through 1932-3. Elementary General Chemistry (Chem. I) was now reduced to one quarter (4 hrs. credit).

Joseph K. Nicholes, M.A. was added to the chemistry staff in 1933 as an assistant professor. He had served as President of Dixie Junior College 1919-1923 and from 1926-1933. In 1933, the L.D.S. Church gave the Dixie College to the State of Utah and a change in personnel of the Dixie faculty and administration was made. Professor Nicholes had been the teacher of chemistry--high school and college, and related subjects, and had also served as President of the St. George Stake of the Church.

The addition of Professor Nicholes to the B.Y.U. Chemistry

staff was very important since it helped to reduce the teaching loads. During the summer of 1930, he audited the general chemistry courses at the University of Chicago under Dr. H.I. Schlessinger, whose textbook had been adopted for use at B.Y.U. in Chemistry 4-5, General Inorganic Chemistry. Prof. Nicholes was assigned this course with Harold Calvin as assistant. Professor Maw and Mr. Wing gave the analytical chemistry courses, and Professor Maw and A.J. Johanson gave the organic chemistry courses. Mr. Peterson gave the Elementary General Chemistry (4 hrs. credit) each quarter, the high school chemistry and physics courses, the Physical Chemistry 82-84 3 hrs. credit per quarter, and the Colloid Chemistry (86) 3 hrs credit and Advanced Inorganic chemistry 109-110 3 hrs. credit. Mr. Peterson had attended the summer sessions at the State University of Iowa and was also pursuing some projected work in chemistry under direction of the Iowa Chemistry Department. The great financial depression of the 1930's caused much unemployment among the population and had some effects on the University. Salaries of the faculty were severely reduced and general curtailments occurred.

The same staff conducted the chemistry courses in 1934-1935 with the addition of two new assistants. They were J.V. Beck and Wreal Lott. The courses in Advanced Inorganic Chemistry were transferred from Peterson to Nicholes, otherwise the assignments were the same as last year. Mr. Johansen was an instructor. An unfortunate incident occurred in an Elementary General Chemistry Laboratory conducted by a very efficient and careful instructor, Mr. A.J. Johansen. A girl used by mistake a red phosphorus instead of ferric oxide as a catalyst and mixed it with potassium chlorate to generate oxygen. The color of the red phosphorus and the ferric oxide were about the same and she failed to read the labels. Upon heating, an explosion occurred which caused the loss of sight in her one eye. A law suit followed in the U.S. Federal Court in Salt Lake City a year or two later in which Mr. Johansen and Mr. Peterson were witnesses. Sympathy for the girl and more competent legal counsel brought a decision in favor of the girl, and the University--indirectly the Church--had to pay an amount of cash awarded by the court as damages.

In the summer of 1935 and the following school year Mr. Peterson was on leave, completing work on his Ph.D. degree at the State University of Iowa. The degree was awarded in 1936. Dr. Loren C. Bryner, who had been graduated from Iowa State College (1934), was added to the staff for 1935-1936 as assistant professor. He was a B.Y.U. Chemistry graduate (B.S. 1928, M.A. 1930). Dr. Bryner was assigned the work which had been previously carried by Mr. Peterson. Advancements in rank occurred for the year 1936-1937. Professor Nicholes became associate professor of Chemistry and H.W. Peterson became assistant professor. There are now one professor, one associate professor, and two assistant professors, and one or two instructors.

In 1937-1941 some new course offerings appear. Zymo-Chemistry (4 hrs. credit) Bryner, and a new Advanced Inorganic and Physical Chemistry dealing with modern concepts of acids, bases, salts, non-aqueous solutions, etc. (3 hrs. credit) Peterson, and Micro Chemical Analysis (3 hrs. credit) Wing. The remainder of the

offering was essentially the same as previously. Dr. Alva J. Johansen was a member of the staff through these years.

On Feb. 2, 1939, the Board of Trustees of B.Y.U. was changed from local membership to the General Authorities of the Church. This was an important step forward because of the added prestige and the increased revenues which became available. The college enrollment was 2834 students and the numbers of degrees conferred were as follows: normal diplomas--61, Bachelors degrees--361, Master's degrees--28.

International stresses developed in 1940-1941, and military service demands were increasing causing anxieties among students. War was declared after the December 1941 attack on the U.S. by the Japanese at Pearl Harbor.

On July 1, 1942, a group of about 300 U.S. Army men were brought to the B.Y.U. campus in an Army Specialized Training Program. These men were given a vigorous schedule of work in Chemistry, Physics, Mathematics, and English--instruction covering six days per week. The soldiers were divided into eight companies for instruction, the writer being assigned to teach seven of these groups in Chemistry, and Professor Nicholes taught one group in Chemistry and had some other work, part of which was coordinator of the program. The Chemistry text used was general Chemistry by H.N. Holmes, with a suitable laboratory guide. Tests were given and graded by the Army, the teachers being denied any access to the tests. It was gratifying to learn that in comparison of group scores earned here and in many other universities offering the ASTP program, our group scored on the average about ten percent higher than the national average on the same tests. Some men "washed out" and were reassigned. This program was terminated on March 30, 1944, when the men were given other military assignments.

During their stay on the campus, the men were housed in the old Stadium House. Areas were designated on the campus where the men were allowed to smoke. The teaching effort was complicated by the variations in the previous academic training of the members of the groups, some having had considerable college training while others had none. The faculty members involved in the ASTP work were paid their regular university pay rate, though it was generally understood that the university was well-paid by the government for providing its facilities.

Male student enrollment was decreased during the war years, but after the war ended in 1945 and the men were gradually released from military service, enrollments were greatly increased with the benefits of schooling provided by the "G.I. Bill of Rights" and the realization by the veterans of the importance of the sciences and mathematics; the students load became greater than the staff and school plant could reasonably carry. The school schedule was lengthened to earlier and later hours, and "advanced" student laboratory instruction was a must. The Chemistry faculty consisted of Dr. Maw, Prof. Nicholes, Dr. Bryner, Dr. Peterson, Prof. Wing, and assistant. The instructional day extended from 6 am to as late as 10 pm.

In 1946 Dr. H.S. Broadbent was added to the staff but was allowed to do a year of post-doctorate study at Harvard U. He began teaching in the fall of 1947 when Dr. J. Rex Goates and Dr.

Albert D. Swensen were also added to the staff. These three well-trained chemists helped greatly in carrying the teaching load. Chemistry laboratory work, mostly in qualitative analysis, was conducted in an improved space in the old book bindery building located across the street south from the old campus.

A new physical science building was projected and in 1947 was authorized by the Board of Trustees. The planning stage consumed nearly three years. Many physical science buildings throughout America were visited by staff for helpful suggestions, which were incorporated into the plans by the architect as far as possible.

The procedure connected with the planning of the building was as follows: The expected needs of the departments (Chemistry, Physics, and Geology) were determined and these were integrated into an over-all plan by the architect. Very many meetings and discussions were engaged in by staff members and individual suggestions considered. The writer proposed (1) that exhibit cases flush with the walls be provided in the hallways, (2) that elevated seating be provided in lecture-demonstration rooms, and (3) that multiple black boards be provided, and (4) that a Foucault pendulum be provided. Numerous other suggestions were made by the staff members, and Dean Eyring was the building supervisor for the President during construction. He assumed that the building would be adequate to meet the needs of the University for the next fifty years.

The Carl F. Eyring Physical Science Center was first used for classes and laboratory work at the beginning of the autumn quarter in 1950. An oil painting of Dean Eyring was presented by Mrs. Eyring and located in a glass case in the main lobby.

The builders (Christianson Brothers General Contractors) used two years to construct the building after the ground breaking May 11, 1948. The building, named the Carl F. Eyring Physical Science Center, was dedicated October 17, 1950 by President George Albert Smith. The cost of the building was over \$2,000,000.

p. 18 Summary of Facts about the ESC

During the late summer of 1950, the chemistry staff, aided by a few students, accomplished the move of the department furniture, library, chemicals and physical equipment, and a chemistry exhibit which had been previously collected by Prof. Peterson and displayed in cases in the lower hallway of the Education Building, was accomplished. The cartoned or boxed materials were moved by trunks and set up in the general supply room and the division supply rooms and in the lecture-preparation room. In these large rooms, the supplies looked very meager. Large orders of additional chemical and smaller items of equipment were soon obtained and systematically distributed to the various supply rooms under the direction of Mr. Clell Covington as the first Superintendent of Laboratories. Professor Nicholes was Chairman of the Department and directed these activities.

In 1955, Professor Nicholes was relieved of the chairmanship and became Professor Emeritus and Dr. H. Smith Broadbent became chairman. The administration of the University announced the policy of rotation of departmental chairmanships every 2 or three years. Dr. Broadbent served until 1958.

With new and quite adequate research facilities, research

projects became a major part of the University science program. Dr. Harvey Fletcher was appointed to be the first Dean of the newly created college of Physical and Engineering sciences (1954), and was also made the first Director of Research (1952). In 1955, Dr. H. Tracy Hall was appointed Professor of Chemistry and Director of Research, and in 1957, Dr. Armin J. Hill became Dean of the College of Physical and Engineering Sciences. Research was promoted the funds for its support coming increasingly from (1) University funds, (2) Government agencies, and (3) Industrial and other outside grants.

On November 22, 1959, the granting by the University of doctoral degrees was authorized.

The Chemistry Department was in the first list of department to be so authorized and conferred the first doctorates (Ph.D.) given by the University in June 1961 upon Owen Kenneth Ash and Waldo Zaugg.

Dr. H. Smith Broadbent's Administration

The Chemistry faculty under the Dean of the Graduate School was required to set up the regulations, requirements, and study programs involved in offering the doctorate. As Chairman of the Department (1955-1958), Dr. Broadbent took the lead in formulating and establishing the department's offering, in courses and procedures. Many chemistry faculty meeting were devoted to this work, and this in addition to the routine operation and continued growth of the department and the University. Some major items of equipment were obtained and research was promoted.

Dr. Keith P. Anderson's administration of the Chemistry Department

Illegible

Dr. Albert D. Swensen's

Drs. Mangum, Bills, and White were added to the Chemistry staff. Under the Federal National defense Education act, three Research Fellowships were obtained, and research in the department was promoted. Several expensive and important additions of equipment were obtained.

Dr. Loren C. Bryner's administration made the transition of the course offerings to that urged by the American Chemical Society. General and analytical chemistry in freshman year, organic chemistry in the sophomore year, physical chemistry in the junior year, and an advanced course (biochemistry or advanced courses in the senior year) with the necessary mathematics and physics courses likewise moved to earlier years. Further additions of equipment were made.

Chairmen of the Chemistry Department since 1903 have been the following:

Dr. C.E. Maw	1903-1946
Joseph K. Nicholes	1946-1955
Dr. H. Smith Broadbent	1955-1958
Dr. Keith P. Anderson	1958-1960
Dr. Albert D. Swenson	1960-1963

Dr. Loren C. Bryner 1963-1965
Dr. J. Rex Goates 1965-

p. 21-27 student list

Sabbatical leaves of absence were hard to obtain because of the lack of funds and replacement staff, and the lack of belief in the need and value of such leaves. After about eighteen years of service, Dr. Peterson obtained, through the agency of President Harris, a leave to extend from the beginning of the Spring Quarter to the beginning of the Autumn Quarter in 1944. During this leave he did research under Dr. George R. Hill and Dr. M.D. Thomas at the Research Laboratory of the American Smelting and Refining Company in Salt Lake County.

Dr. Peterson received his University salary during this half-year and also his salary for research. This was the first time such an arrangement had been made and resulted in severe criticism by the Department Chairman. Doing research for pay while receiving a B.Y.U. sabbatical leave salary has been the rule since 1950 among the Chemistry faculty members. Some members have gone to other locations while others have remained on campus while doing research for pay for an agency.

On July 1, 1945, President Harris left the Presidency of B.Y.U., and Howard McDonald became President of the University. Also on July 1, 1946, Dr. Maw became Professor Emeritus of Chemistry and Professor Nicholes was made chairman of the Chemistry Department.

It must be said of Professor Nicholes that he did his very best to promote the growth and development of the Department during the years of his chairmanship. (1946 to 1955).

AIDS AND RECOGNITION--Sigma Xi

In the year 1935, the members of Sigma Xi on the staff at Brigham Young University were organized into a club for the purpose of furthering the scientific aims of the Society of the Sigma Xi. Since that time, the organization remained continuously intact and used its influence in the University toward the encouragement of research and other activities in the various branches of science. The club sponsored several scientific lectures by individuals outside the club, including a National Sigma Xi lecture, each year by a member of the club, and also awarded an annual medal to an outstanding student at the completion of a research project.

In 1949 members petitioned the Society for a charter to form a chapter of sigma Xi at Brigham Young University. This was granted by the Society, and a chapter was installed by Dr. Donald B. Prentice of Yale University. The chapter has been operating since October 17, 1950, and has conferred many full, as well as associate (student) memberships. The chapter has continued to give awards for excellence in research, to sponsor National and other lectures from outside the chapter, and an annual lecture by a Chapter member at the time of the annual banquet and initiation program for new members.

Of the 33 members of Sigma Xi who were at B.Y.U. in October

1949, who petitioned for a charter for a B.Y.U. chapter--the following seven men were members of the B.Y.U. Chemistry faculty: H. Smith Broadbent, Iowa State College; Loren C. Bryner, Iowa State College; James R. Goates, University of Wisconsin; Hugh W. Peterson, State University of Iowa; Charles E. Maw, Stanford University; Joseph K. Nicholes, Stanford University; Albert D. Swenson, University of Utah.

AIDS AND RECOGNITIONS-American Chemical Society

Another important factor in the development of research in Chemistry has been the Salt Lake Section of the American Chemical Society. Lectures are sponsored by the Section as they can be arranged, generally once or twice per month. Associate Memberships for advanced students (student affiliate groups) are promoted. Student and faculty researchers are discussed at an annual field day attended by Chemistry faculties and advanced by students from all Utah universities. All members of the American Chemical Society and the affiliates living in the Salt Lake City, Provo, Logan, and Ogden areas are entitled to membership in the Section, whether employed in the industry, university, or government work. This has stimulated the development of interest in chemistry at Brigham Young University.

AIDS AND RECOGNITIONS-Utah Academy

The Utah Academy of Sciences, Arts and Letters, an affiliate of the American Association for the Advancement of Science, likewise has given opportunity for reporting chemical researches, and their publication in the proceedings of the Academy. Two meetings are held per year at the larger universities, one in the Spring and one in the Fall.

CHEMICAL ENGINEERING SEPARATED FROM CHEMISTRY

After the organization of the College of Physical and Engineering Sciences in 1954, Chemical Engineering was part of the Chemistry Department and Dr. Billings Brown was the chief chemical engineer. Others were added (Dr. James J. Christensen, Dr. Bill J. Pope, Dr. Dee H. Barker, et al.) in order to become an accredited department, the Chemical Engineering had to become an independent department, and the department is now fully accredited by the Engineering Council for Professional Development. The Chemistry Department has been fully accredited by the American Chemical Society for many years, for the training of professional chemists.

faculty listing p. 30-32

The Chemistry Department minutes of the Faculty Meeting held December 1, 1965, mentioned faculty recruitment thus: "The faculty voted to make the first choice selection for new faculty members

for next year from the area of physical chemistry, the second choice from the area of biochemistry, and all additional men without restriction to specific area."

It should be noted that the chemistry faculty has for many years been asked by the administration to investigate the qualifications of prospective faculty members and to recommend its preferences before negotiations are completed by the administration of the University.

ABSENCE OF FACULTY MEMBERS FROM THE UNIVERSITY

The Chemistry faculty members have for many years maintained an excellent cooperative and friendly attitude toward each other, particularly during the absence of members from the University because of illness, attendance at conventions, or family funerals, and during other administration approved absences. During such absences of faculty members, their work has been carried by other faculty members without pay for so doing, and the absent member's regular salary has not been reduced because of his absence from his work assignment. This is a commendable attitude and relationship.

SUPPLY SERVICE

With the greatly increased student enrollment which accompanied the addition of the enlarged facilities of the Eyring Science Center, with its large general supply room on the first floor, and one or more specialized student supply rooms on each of the four floors, an administrative and service organization was required. A general Superintendent of Laboratories and Supplies was appointed who had charge of ordering and receiving and distributing needed supplies and equipment, inventories, student laboratory, quiz, and reading (grading) selections and scheduling, supply room personnel and the general rules for dispensing and accounting, and the administration of research equipment and accounting. The men appointed and who served as Superintendent of Laboratories were:

Mr. Clell Covington	1948-1952
Mr. J. LaMar Larsen	1952-1955
Mr. Richard L. Meibos	1955-

All were chemistry graduates. The title of Superintendent of Laboratories and Stores was changed on June 1, 1965, to Supervisor of Laboratories at which time the Chairman of the Department took over the personnel aspect of the previous Superintendent.

At this time (June, 1965), an administrative assistant to the Department Chairman was appointed. Dr. Eliot A. Butler began serving in this capacity under Chairman, Dr. J. Rex Goates.

Very substantial annual budgets are required to purchase supplies and services; a great contrast to the few dollars available to Professor Talmage in 1884.

SPECIAL EQUIPMENT

Modern chemical research requires delicate and very specialized equipment, many items being similar to those used in physics measurements and calculations.

The university computer Research Center has excellent equipment for research in many fields of investigation and is available for chemical studies. The computers include an IBM 650 (1958), an IBM 7040 (1963) and an IBM 1401 (1964).

The Chemistry faculty members have for many years maintained an excellent cooperative and friendly attitude toward each other, particularly during the absence of members from the University. During such absences, their work has been carried by other faculty members, though not on an equal basis, and the absent member's work assignments. This is a commendable attitude and relationship.

SUPPLY SERVICE

With the greatly increased student enrollment which accompanied the addition of the new facilities of the Spring Science Center, with the large general supply room on the first floor, and one or more specialized student supply rooms on each of the four floors, an administrative and service organization was required. A general superintendent of laboratories and supplies was appointed who had charge of ordering and receiving and distributing needed supplies and equipment, inventories, student laboratory duties, and reading (grading, selections and scheduling, supply room personnel, and the general kitchen dispensing and accounting, and the administration of research equipment and accounting. The man appointed and who served as superintendent of laboratories were:

Mr. Glenn Covington 1951-1952
Mr. U. Larry Larson 1952-1955
Mr. Richard J. Melton 1955-1957

All were chemists previously. The title of Superintendent of Laboratories and Stores was changed on June 15, 1957, to Supervisor of Laboratories at which time the Chairman of the Department took over the personal aspect of the previous Superintendent. At this time (June, 1957) an administrative assistant to the Department Chairman was appointed, Dr. Elmer A. Butler began serving in this capacity under Chairman Dr. U. Rex Gossett. Very substantial annual budgets are required to purchase supplies and services, a great contrast to the few dollars available to Professor Salinger in 1950.