

FOUR GIANTS IN A COLLEGE CHEMISTRY DEPARTMENT: OBERLIN COLLEGE, 1880-1966*

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Although the teaching of chemistry at Oberlin College began a year after the founding of the college in 1833, a distinct chemistry department dates from just before 1880. This paper focuses on the 86-year period from 1880 to 1966. To give this brief historical account shape and texture, the emphasis is on four prominent figures who were chemistry faculty members during this time period. Those persons are Frank F. Jewett, Harry N. Holmes, Luke E. Steiner, and J. Arthur Campbell. Holmes, Steiner, and Campbell were nationally known. Jewett joined the faculty in 1880, another reason for the starting date of this account. Steiner retired from the faculty in 1966, the reason for the final date. Campbell left the faculty in 1957 to become one of the founders of Harvey Mudd College. The many other faculty members who contributed much to making chemistry at Oberlin College a vital and effective program during this time period are listed in Table 1.

Frank F. Jewett

Frank F. Jewett (faculty member from 1880–1912) is best known as the mentor of Charles M. Hall, who discovered the electrolytic process for refining aluminum

metal in Oberlin in February 1886, within eight months of his graduation from college, and who in 1888 became one of the founders of the Pittsburgh Reduction Company, known today as Alcoa. Figure 1 is a photograph of Frank Jewett when he was about 40 years old and working with Hall. Jewett was as well educated in chemical science and as widely experienced as any American academic of his day. He had received his B. A. from Yale in 1870 and had returned two years later to do master's degree work in chemistry and mineralogy at the new Sheffield Scientific School at Yale. He then spent a year (1874-75) studying in Friedrich Wöhler's laboratory in Göttingen, the leading laboratory of chemical science in Germany in those years (1, 2).

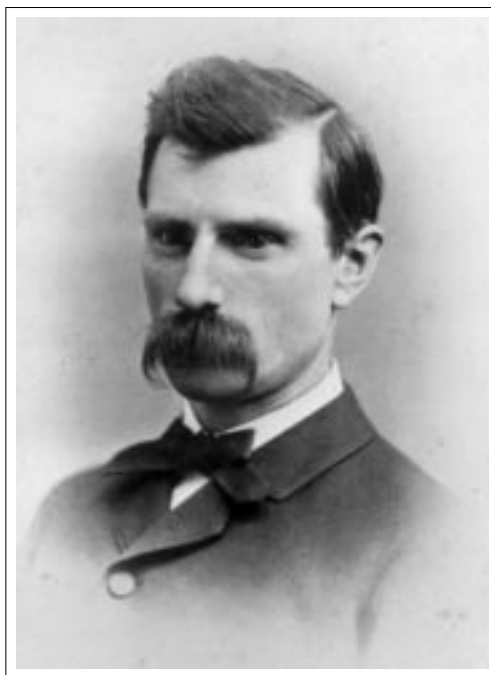


Figure 1. Frank F. Jewett at about forty years of age when C. M. Hall was developing the process for refining aluminum metal.

Jewett returned to the US to take a position as assistant to Wolcott Gibbs at Harvard (1875-76). At the end of a year with

Gibbs, Jewett was persuaded by the president of Yale to accept an appointment at the Imperial University in Tokyo, Japan. Having been one of the first half-dozen westerners to teach chemical science in Japan, he returned to the US after three-and-one-half years to ac-

cept an appointment in 1880 as Professor of Chemistry and Mineralogy at Oberlin College (3).

Frank Jewett took the place of William K. Kedzie, who had known Jewett when both were graduate students at Yale. Kedzie was the son of William C. Kedzie, who became well known as the president of Michigan State College. The younger Kedzie, who brought to Oberlin enthusiasm and modern instruction in chemistry, including laboratory work for students, succumbed to a respiratory illness after a year and a half but not before “naming” Jewett as his successor. When Jewett arrived in Oberlin in the summer of 1880, he found a “new” laboratory building fashioned out of an old public school building, which was shared with the professor of biological sciences. This building, called Cabinet Hall, is shown in Fig. 2. Equipment for experiments was barely adequate and did not include a good analytical balance. Jewett described having to crawl under the floorboards in cold winter weather to thaw water pipes with a Bunsen burner and characterized these facilities as distinctly inferior to the new and well-equipped ones he had known in Japan. Finding financial support for adequate equipment was a continuing challenge for him (1).

At first the only chemistry course that Jewett taught was a general inorganic course for juniors. He also taught mineralogy and some other courses such as rhetoric. Qualitative and quantitative analysis and a course in organic chemistry were soon added, all taught by Jewett. Laboratory work for the students remained optional until 1895, when Jewett finally had an assistant to help with the laboratories. When the north wing of the laboratory building was sacrificed to build a new college building in 1886, Jewett inherited the whole of the remaining structure (1).



Figure 2. Cabinet Hall in the early 1880s when it housed the departments of chemistry and biological sciences.

The great respect for Frank Jewett as a teacher of chemistry and the mentor of Charles Hall was recognized when the father of one of his former students provided financing for the construction of a first-class chemistry building. Louis Severance, college trustee and treasurer of the Standard Oil Company, donated funds for the building, for equipping it, and for endowing the Severance professorship. Jewett was ready with plans, having taken the occasion of a sabbatical year (1895–96) to visit new chemistry laboratories in Berlin and Leipzig and then, in the US, to visit the laboratories at Amherst, Williams, and Yale. Severance Laboratory, shown in

Fig. 3, was completed in 1901. Following his remarks at the dedication, Ira Remsen, distinguished chemist and president of Johns Hopkins University, said that he wished he had as good a laboratory himself (1).

A chemist's whim was expressed in Severance

Laboratory. The library on the second floor was shaped as an elongated benzene ring, made possible by the truncated intersection of the two wings of the building. Remarkably, commodious Severance Laboratory, complete with three instructional laboratories, was built for Jewett and one assistant. It was sufficiently large to serve the department of chemistry well until 1961, when it housed six faculty members, a laboratory manager, a departmental secretary, and a few M. A. students, as well as providing adequate space for classrooms, four instructional and some research laboratories.

In effect, Jewett and Hall exchanged places on the world stage. Hall was the technical innovator behind the worldwide aluminum industry; he was so recognized in his lifetime. After Jewett came to Oberlin in 1880, he became deeply involved in building up a compre-

hensive program in chemistry and in working for the community. He supported missionary teaching in Asia, served on the City Council, developed one of the first municipal water treatment facilities, for which he did the analyses, and served as the official US weather observer in Oberlin. Other than several editions of a locally produced laboratory manual, his publications were few in number (4).

In addition to Charles Hall, another famous student of Jewett was Robert Millikan, Nobel prize winner in physics and developer of Caltech. Jewett also maintained a lifelong friendship with Edgar Fahs Smith, distinguished chemist, historian, and president of the University of Pennsylvania, whom Jewett addressed as "Chum" in correspondence (5). They had been students together in Göttingen. For a private publication following Frank Jewett's death, his wife chose to name the booklet *The Beloved Teacher*, an apt choice for Jewett's life work and impact (3).

After Jewett's retirement in 1912, Alan W. C. Menzies, a Scotsman with a recent Ph.D. from Chicago, was appointed to the headship of chemistry, in competition with offers from Chicago and Columbia. The chemistry faculty was then three in number. Menzies remained in Oberlin for only two years before he left for what he undoubtedly regarded as a more prestigious and research-active position at Princeton. He was probably also concerned that his doubts about religion were incompatible with Oberlin College in those days (6).

Harry N. Holmes

In 1914 Harry N. Holmes (faculty member from 1914-1945) was appointed to the chemistry faculty and subsequently developed for himself and the department a national reputation. Figure 4 is a photograph of Harry Holmes. He had received his Ph.D. with Ira Remsen and J. C. W. Frazer at Johns Hopkins in 1907 and had taken a position as the sole teacher of chemistry at Earlham College, where he remained for seven years before moving to Oberlin (1). Holmes had equal interests in teaching and in research. In an exchange of views

with W. A. Patrick of Johns Hopkins in the first volume of the *Journal of Chemical Education*, Holmes made his position clear regarding the importance of research in a college. After citing several well-known academics who supported doing research with undergraduates, he wrote (7):

A stimulating freshness and a feeling of authority come to the college teacher as he unravels the secrets of science. The teacher profits, the great body of science profits, and the pupil profits. The pupil feels that he's near one of the fresh springs that feed the stream of knowledge into which he has been dipping.

Patrick felt that combining teaching with research reduced the quality of both and that teachers should limit their scholarship to combing the journals for the latest developments (8). Although Holmes had little time and no

coworkers to do research at Earlham, he investigated ozone levels as a function of changing weather by carrying starch iodide paper in an open test tube in his coat pocket. These observations led to his first independent paper entitled "Atmospheric Ozone" (9). No doubt, the modern and extensive facilities in Severance Laboratory, inherited from the Jewett era, attracted Holmes to the headship at Oberlin, where he joined two other faculty colleagues.

At Oberlin, Harry Holmes taught organic chemistry and general chemistry for a while and then settled into teaching general chemistry and colloid chemistry. A natural showman with an engaging manner and a commanding presence, Holmes made a lasting impression on students in general chemistry. His popular lectures were extensively illustrated with lively dem-



Figure 3. Severance Chemical Laboratory, completed in 1901.



Figure 4. Harry Holmes at the time he was President of the American Chemical Society.

onstrations. After discussing chemical explosives, for example, Holmes did not hesitate to toss a sample of TNT to an unsuspecting student and expect him to catch it. He once led a whole general chemistry class on tip-toe out of the lecture room, leaving a sleeping student in the front row to awake in unexpected isolation. He played leading roles in community dramas (10).

Holmes's widely used text, *General Chemistry*, first published by Macmillan in 1921 along with a laboratory manual, went through five editions until 1949. He was an early advocate of incorporating semi-micro qualitative analysis into the general chemistry laboratory. As early as 1920, he had written instructions for such a qualitative analysis program in an unpublished pamphlet. Soon after his first book, two other introductory texts appeared: *Introductory College Chemistry*, 1925, and *Elements of Chemistry*, co-authored with L. W. Mattern, a high school teacher in Washington, DC, in 1927, both published by Macmillan. Richard Remsen Holmes, Harry Holmes's chemist son, recalls that his father's income from texts often exceeded his income from the college. Holmes also wrote several popularizations of chemistry, including *Out of the Test Tube*, *Have You Had Your Vitamins?* and *Strategic Materials and National Strength*.

Holmes's research interests were in three areas. One was colloid chemistry, for which he taught a laboratory course and wrote a manual, *Laboratory Manual of Colloid Chemistry*, first published by John Wiley in 1922. A text with the title, *Introductory Colloid Chemistry*, followed in 1934. His interests in colloids led to a second area of research, the early use of alumina, silica gel, and other adsorbents for column chromatography. In the early 1930s Holmes's students were among the first to make extensive use of column chromatography to purify substances (11). This work led to a third area of research on vitamins, including the first crystallization of vitamin A. For this work with vitamins, techniques were developed to carry out column chromatography at dry-ice temperature. His coworkers were also among the first to do what is today called "flash chro-

matography" in an attempt to purify penicillin in the 1940s, the increased pressure being achieved with a bicycle pump. Fig. 5 shows the flash chromatography apparatus developed in Holmes's laboratory.

Holmes's interest in vitamins led him to be an early proponent of megadoses, especially of vitamin C. Of course, Linus Pauling was a more recent advocate of large doses of vitamin C to ward off the common cold. That he was aware of Harry Holmes's earlier advocacy was revealed when he met an Oberlin faculty member at a conference in 1986 and, as an item of conversation, Pauling said so (12).

Some regarded Holmes as more showman and publicist than a scientist (13). There can, however, be no question about his overall effectiveness at Oberlin and at the national level. Many former students have attested to the inspiration they received from his teaching and to his ability to attract able chemistry students to Oberlin (10). These talents as a teacher were recognized in 1955 with the James Flack Norris

Award of the Northeastern Section of the American Chemical Society. In 1954, Holmes was also the first to receive the ACS Award in Colloid Chemistry, sponsored by the Kendall Company.

In contrast to Frank Jewett, Harry Holmes had an enviable publication record and was widely known. In addition to his many textbooks, he was the author of 70 research papers and 9 patents. The culmination of his career was election as President of the American Chemical Society in 1942. Another high point near the end of his career was the graduation in 1943 of three students who have made outstanding contributions to chemical science: Ralph Hirschmann, who, while at Merck, was a leader in the first synthesis of an active enzyme, ribonuclease; David Gutsche, who, at Washington University, developed early synthetic examples of molecular recognition in calixarenes; and James Boggs, who has made notable experimental and computational contributions in the field of molecular structure at the University of Texas.



Figure 5. An apparatus to do flash chromatography in 1943. The photograph was supplied by C. David Gutsche, who did this work as part of his honors research.

Comparable to Holmes's interest in chemistry was his interest in golf. An excellent player, he helped in many ways with the local golf club. During the 1930s, he redesigned and participated in rebuilding the nine-hole golf course in Oberlin (14). In his latter years he also became an ardent painter with oils on canvass. For the Chicago ACS meeting in 1950, he organized a show of paintings by a number of chemists.

At least twice during his tenure on the Oberlin faculty, Harry Holmes received enticing outside offers. One was to become Dean of the School of Chemistry and Chemical Engineering at Penn State. Another was to become director of the Battelle Institute. Although Oberlin College had an undifferentiated salary schedule within faculty ranks in those days, the college responded by establishing the Hall Instructorship that provided Holmes with a regular postdoctoral appointee (10).

Luke E. Steiner

Luke E. Steiner (faculty member from 1928-1966) joined the Oberlin College faculty in 1928. An Oberlin graduate of the class of 1924 and a student of Holmes, Steiner had completed a Ph.D. in chemical thermodynamics under John Johnston at Yale in 1927 and had served as an instructor there for one year. Steiner was the first member of the faculty to hold a Ph.D. in physical chemistry and the first to have a good grasp on the rapidly developing theoretical basis of chemistry (15). The 1920s were, of course, the

decade in which quantum mechanics was developed and in which thermodynamics and statistical thermodynamics became accepted parts of the curriculum in the leading institutions. Fig. 6 is a photograph of

Luke Steiner with many thermodynamics texts on the shelves behind him.



Figure 6. Luke Steiner in 1961 with many thermodynamics texts on the shelves behind him.

Over his 38-year career on the Oberlin faculty, Steiner developed a "school" of thermodynamics. Soon after his appointment to the faculty, he began writing a text, *Introduction to Thermodynamics*. After a number of tryouts in his senior/graduate-level course, this book was published by McGraw-Hill in 1941 and went through a second edition. Among the students who prepared notebooks filled with solutions to the numerous, challenging problems from this text and who went on to make notable contributions in thermodynamics were Henry A. Bent (Connecticut, Minnesota, North Carolina, and Pittsburgh), William C. Child (Carleton), Norman C. Craig (Oberlin), Howard J. DeVoe (Maryland), Eric A. Gislason (Illinois at Chicago), William B. Guenther (University of the South), Reed A. Howald (Montana State), Roger C. Millikan (General Electric, UC Santa Barbara), Kenneth H. Sauer (American University in Beirut, UC Berkeley), and John C. Wheeler (UC San Diego). Other Oberlin chemistry students in Steiner's time who made major contributions to thermodynamics but who did not take the course were J. Arthur Campbell (Oberlin, Harvey Mudd), Ward N. Hubbard (Argonne Laboratory), Hilton A. Smith (Tennessee), and Stephen S. Wise (Mobil Oil). In 1969 after Steiner's retirement, the Division of Chemical Education held a symposium on the teaching of thermodynamics, at which two of his former students presented papers and at which he was acknowledged for his many contributions in this area of science (16).

Upon Harry Holmes's retirement in 1945, Steiner became head of the department of chemistry and held this position until one year before his retirement in 1966. By that time at Oberlin College, with few exceptions department chairmanships had become rotating positions. In the early 1950s Steiner negotiated the conversion of the Hall Instructorship into a regular faculty position to give the department a faculty of six.

In addition to teaching thermodynamics, Steiner regularly taught general chemistry. Despite having to compete with Holmes's commanding personality as the teacher of other sections of this course, Steiner had his adherents among the students for his more fundamental and challenging approach to the subject and his remarkable patience. Although he also kept his hand in research and remained an uncompromising advocate of undergraduate research experience, especially the college's Honors program for seniors, his principal contributions were in the area of chemical education.

Steiner wrote texts at several levels in the college curriculum and for high school students as well. In 1938



Figure 7. Kettering Hall soon after it opened in 1961. The quartz aggregate section in the foreground housed the Science Library and the main lecture halls; the chemistry half of the building is immediately to the left.

he completed the fourth edition of *Second Year College Chemistry* (John Wiley), whose author, William Chapin, Steiner's colleague, had suffered a stroke. A new edition of the accompanying laboratory manual followed in the mid 1940s. From its publication in 1922, *Second Year College Chemistry* was exceptional in presenting an introduction to physical chemistry and analytical chemistry in a single text. With J. Arthur Campbell as coauthor Steiner wrote a laboratory manual for general chemistry and a modern first-year text, *General Chemistry*, which were published by Macmillan in 1955. This text, like Pauling's pathbreaking 1950 text, had many illustrations of space-filling models of chemical substances. This writing in the general chemistry area soon led to Steiner's authorship of the text, *Modern Chemistry*, for John Baxter's 1958-59 television series, "Continental Classroom." In the final episode of this TV series, Baxter said, "More than any other person, Professor Luke E. Steiner of Oberlin College helped set the tone and content of the course. To this wise and kindly teacher I owe a debt I can never repay. Those who have been fortunate enough to have worked with him know whereof I speak (17)."

Shortly after writing *Modern Chemistry*, Steiner served as one of the lead writers for the text for the National Science Foundation-sponsored ChemStudy program that revolutionized the teaching of high school chemistry in the 1960s. In 1963 Steiner also served as the Chair of the Division of Chemical Education. After retirement he spent two years at Berkeley making strong contributions to texts in the Science Curriculum Improvement Study (SCIS), designed for pre-high-school

students. The wide range of Steiner's textbook writing prompted a colleague to say that Steiner covered chemistry from the cradle to the grave.

Steiner's final great contribution to chemistry at Oberlin was guiding the planning of a new science building, Kettering Hall, to a successful completion. Fig. 7 is a photograph of Kettering Hall, which was shared with the biology department and completed in 1961. It not only had outstanding space for instructional laboratories and a new science library, but it provided each faculty member with first-class research laboratory space. Kettering Hall also proved easily adaptable to the age of intensive use of instrumentation that was dawning in the early 1960s. The fine facilities spawned an era of exceptional research productivity at Oberlin College.

J. Arthur Campbell

J. Arthur Campbell (faculty member from 1945-1957) replaced Harry Holmes in 1945, as a most worthy successor. Art Campbell, who liked bow ties in his early days, appears in Fig. 8. An Oberlin graduate of the class of 1938 who had studied with both Holmes and Steiner, Campbell had acted in plays during his undergraduate years. A tall, commanding figure with an actor's flair, similar to Holmes, Campbell was unusually effective in the classroom. He was an engaging presenter of lecture demonstrations. An example is the famous "blue bottle" experiment, described and explicated in his book, *Why Do Chemical Reactions Occur?* (18).

After graduating from Oberlin, Campbell spent a year completing an M.S. at Purdue but then moved on to UC Berkeley, where he completed a Ph.D. in 1942 in physical chemistry under Joel Hildebrand. While using X-ray methods to study the local structure in liquid mercury and liquid xenon, he also became infected with Hildebrand's enthusiasm for teaching undergraduates. Upon completing his Ph.D., Campbell joined the Manhattan project at Berkeley, where he served for three years as

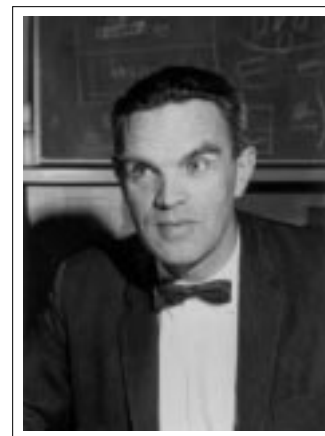


Figure 8. J. Arthur Campbell during his days as an Oberlin College faculty member.

an instructor and a researcher focusing on electrochemical methods for reducing uranium (19).

Campbell was an energetic innovator. Soon after he began teaching physical chemistry upon the retirement of James McCullough in 1949, he introduced the identification of an unknown organic liquid as the organizing principle for applying a variety of physical methods in the laboratory. He designed and had made in the college shop large, space-filling molecular models and a periodic table displaying atomic radii with wooden spheres. Subsequently, charts showing these atomic radii graced the walls of classrooms and lecture halls throughout the country. Campbell was one of the first to use Walter Moore's revolutionary new text, *Physical Chemistry*, despite its numerous, student-challenging errors. In the general chemistry laboratory, Campbell introduced limited unknowns, which gave qualitative inorganic analysis a more exciting, research-like character. He used Linus Pauling's *The Nature of the Chemical Bond* to teach seniors and M. A. students modern ideas about bonding.

Exceptionally interested in students, Art Campbell and his wife Dorothy held weekly open houses at their home on Sunday afternoons. Campbell continued Holmes and Steiner's practice of hosting the Alchemists Club, monthly afternoon teas complete with beakers for cups and citric acid and sucrose for flavoring, at which the best students in general chemistry met informally with the teacher and learned about new research developments in chemistry. Campbell's interest in students and his effectiveness in classrooms and laboratories drew many students into chemistry. Campbell was a dedicated practitioner of the Socratic method. As a student at Oberlin College, the author heard it said of Campbell, "Don't bother to ask him a question about chemistry. He'll ask you twenty questions, and it will turn out that you knew the answer all along."

Although Campbell's principal interest was in chemical education, he, like Steiner and Holmes, was a staunch advocate of research experiences for undergraduates. He regularly sponsored student research projects during the academic year but chose to spend most summers teaching elsewhere, at Ohio State, Michigan State, and Wisconsin. A year's research leave, spent in part at Cambridge, England, gave him expertise in applying X-ray methods to analyzing crystal structures. Some of this work was continued at Oberlin with the equipment in the physics department. His research emphasis at Oberlin, however, was the application of

thermal analysis to the decomposition of chromate salts and of photometric methods to understanding the pH dependence of the equilibrium between chromate and dichromate ions. During his 12 years on the Oberlin faculty, Campbell published several research papers. In the area of chemical education, as already noted, he and Steiner produced a laboratory manual and the text, *General Chemistry*, in 1955. In addition, numerous papers in chemical education appeared throughout Campbell's career.

Fresh from his participation in the Manhattan Project, Campbell was a public spokesman for peaceful uses of atomic energy. On at least one occasion, he was selected by the members of the senior class in the college to give an all-campus assembly talk. He chose to speak about atomic energy as well as the importance of science. In general, he was a public figure on the campus. In 1948 in an issue of *Isotopics*, which he edited for the Cleveland section of the ACS, and in a letter to the then-president of the college, Campbell raised questions about the legality of the pressures being brought to bear on scientists because of hearsay evidence of Communist affiliations (20). He began a term as chair of the Division of Chemical Education in 1950, a mere five years after he began teaching at Oberlin College. He spent the 1956-57 academic year in Washington, DC working as Director of Institutes at the National Science Foundation and did not return to the Oberlin faculty.

In the spring of 1956, Campbell was invited to Claremont, CA as a candidate for the presidency of Harvey Mudd College, which was in its prenatal period. Although Campbell was not interested in the presidency, by the end of the fall of 1956 he had agreed to be one of the founders of the college and the first professor of chemistry. When asked why he had decided to leave Oberlin, he said, "At age 40, one should get a new wife, a new house, or a new job. I chose a new job." Being a founder of a new science-oriented college and a shaper of its chemistry program was a powerful attraction, as was returning to California, which he and his wife had grown to like during their years in Berkeley.

Soon after his appointment to the Harvey Mudd faculty, Art Campbell was tapped by Glenn Seaborg to be the director of the NSF-sponsored ChemStudy program. Through its formative years, Campbell played a crucial role in directing this national program that transformed the teaching of high school chemistry. Campbell was very interested in the innovative use of films in edu-

cation. Consequently, he acted in a number of the ChemStudy films and guided the production of many others (19).

Art Campbell led in the emergence of Harvey Mudd as the premier science college in the US and wrote several more texts. A frequent traveler for UNESCO, he became known throughout the world for his contributions to chemical education (19). Campbell's career, which had such a strong start during his 12 years on the Oberlin faculty, skyrocketed during his 29 years on the Harvey Mudd faculty. Had he not been diagnosed with bulbar ALS in 1986, he would not have withdrawn as a

candidate for the presidency of the ACS. He would surely have been a very strong candidate and a very likely choice of the electorate.

Epilog

Much of significance has occurred in the chemistry department at Oberlin College since the mid 1960s. Already noted is the extent to which a balance between teaching and research, as advocated so clearly by Harry Holmes, reemerged. This change occurred without the support of graduate students through most of this time

Table. Chemistry Faculty Members, Oberlin College, 1834-1966*

1834-78	James Dascomb (M.D., Dartmouth)
1878-80	William K. Kedzie (B.S., Agricultural College of Michigan; M.S., Yale)
1880-1912	Frank F. Jewett (B.A., M.S., Yale)
1899-1900	Joseph S. Chamberlain (B.S, M.S., Iowa State; Ph.D., Pennsylvania)
1895-96, 1901-06	Thomas M. Taylor (B.A., Oberlin; Ph.D., Pennsylvania)
1906-07, 1910-37	William H. Chapin (B.A., Oberlin; Ph.D., Pennsylvania)
1907-49	James C. McCullough (B.S., M.S., Case Institute)
1912-14	Alan W. C. Menzies (B.Sc., M.A., Edinburgh ; Ph.D., Chicago)
1914-45	Harry N. Holmes (B.A., Westminster; Ph.D., Johns Hopkins)
1917-18, 1920-21	Edwin H. Cox (B.S., Earlham; M.S., Louisville; M.A., Harvard; D.Sc., Geneva, Switz., 1922)
1921-22, 1925-44	Alfred P. Lothrop (B.A., Oberlin; Ph.D., Columbia)
1922-25	Edna H. Shaver (B.A., M.A., Oberlin; Ph.D., Chicago, 1937)
1928-66	Luke E. Steiner (B.A., Oberlin; Ph.D., Yale)
1937-75	Werner H. Bromund (B.A., Chicago; M.A., Oberlin; Ph.D., New York University, 1942)
1942-43	Clara M. Deasy (B.A., M.S., Ph.D., Cincinnati)
1944-78	William B. Renfrow (B.A., Furman; Ph.D., Duke)
1945-57	J. Arthur Campbell (B.A., Oberlin; M.S., Purdue; Ph.D., UC Berkeley)
1949-51	Robert E. Lyle, Jr. (B.A., Emory; Ph.D., Wisconsin)
1952-58, 60-63	Barbara H. Bunce McGill (B.A., Bryn Mawr; Ph.D., Harvard)
1952-84	Peter J. Hawkins (B.Sc., Ph.D., London)
1956-59	Carl W. Kammeyer (B.A., Carthage; Ph.D., Illinois)
1957-2000	Norman C. Craig (B.A., Oberlin; Ph.D., Harvard)
1958-60	Norman J. Hudak (B.A., DePauw; Ph.D., Cornell)
1960-93	Richard C. Schoonmaker (B.Chem.Eng., Yale; Ph.D., Cornell)
1963-66	James S. George (B. A., Allegheny; Ph.D., Illinois)
1963-2000	Terry S. Carlton (B.S., Duke; Ph.D., UC Berkeley)

*Omitted are persons who held one-year appointments except for Chamberlain.

period, the masters degree program having been discontinued in 1975, or of postdoctorals. The challenge of finding funds for modern instrumentation and for the support of students has been met again and again. With few exceptions faculty members have devoted summers to working closely with undergraduate students in the research laboratories. The era of textbook writing, such a prominent theme in the time of Holmes, Steiner, and Campbell, is now but a memory. Yet, the four giants described in this account stand proudly in the background and provide palpable challenges to the present faculty. The Jewett Scholarship award for sophomores, the Steiner Lectureship, and the Holmes Award for seniors are welcome reminders to students as well as faculty of these remarkable individuals. Oberlin College awarded honorary degrees to Luke Steiner (1978) and J. Arthur Campbell (1988).

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ABOUT THE AUTHOR

Norman Craig holds a B. A. in chemistry from Oberlin College, where he was a student of Luke Steiner and J. Arthur Campbell. The author holds an M.A. and a Ph.D. in physical chemistry from Harvard University. In 1957 he replaced J. Arthur Campbell on the Oberlin chemistry faculty. He is the author of two articles about Charles Hall, Frank Jewett, and Julia Hall, Hall's sister. These articles are "Charles Martin Hall—The Young Man, His Mentor and His Metal," *J. Chem. Educ.*, **1986**, 63, 557-559; and "Julia Hall—Coinventor?" *Chemical Heritage*, **1997**, 51:1, 6-7, 36-37. Another article on the history of chemistry is "Correspondence with Sir Lawrence Bragg Regarding Evidence for the Ionic Bond," *J. Chem. Educ.*, in press.