

## THE EARLY DAYS OF CHEMISTRY AT CATHOLIC UNIVERSITY\*

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*Leopold May, The Catholic University of America*

In the late nineteenth century, several universities were founded as graduate schools in the United States: for example, Stanford University in the West and Johns Hopkins University in the East. In 1884, the Bishops of the Catholic Church of the United States decided to found a graduate school, which opened in 1889 with 37 students in the sacred sciences (1).

With the advent of graduate schools, no longer would anyone seeking advanced studies in chemistry need to travel to Europe. So, Rev. John J. Griffin went to Johns Hopkins to pursue a doctorate with the organic chemist, Ira Remsen. In 1895 he presented his thesis entitled "On the Reaction of Ethyl and Methyl Alcohol with Paradiazometatoluenesulphonic Acid in the Presence of Certain Substances; and on Metatoluenesulphonic Acid" (2). Griffin, born in Corning, NY, on June 24, 1859, earned an A.B. in 1881 and a M.A. in 1883 from Ottawa College (Canada). After being ordained on May 1, 1885, he served as Instructor in Elementary Physics, Ottawa College, 1885-1886, and then spent 1886 with the Archdiocese of Boston. This year of service yielded important results because years later the priests in Boston contributed funds to purchase chemical journals for the Department of Chemistry at Catholic University. After serving as Instructor in Elementary Physics and Chemistry, Ottawa College, 1887-1890, he started his doctorate studies. During the next five years, during his studies in Baltimore, MD, he taught chemistry at St. Joseph's Seminary and the College of Notre Dame of Maryland (3).

The association with the latter was to last many years. For example (4):

Reverend John Joseph Griffin of the Catholic University of America" was "instrumental in establishing the chemistry curriculum.".... in 1910. Fr. Griffin flew to purchase state of the art science and laboratory making the new lab "...the finest and most up-to-date in any Catholic college for women.

The chemistry club at the college is named after Griffin. In 1897, a collection of crayon portraits of celebrated chemists was donated by the college to the Department of Chemistry at Catholic University and displayed so that "...the student is constantly reminded of those eminent workers who laid the foundation and aided the development of the science" (5). Unfortunately, these are no longer in the Department. After about a year's illness, Griffin died on November 15, 1921 at the Notre Dame Convent in Baltimore, which is associated with the Notre Dame College.

After receiving his doctorate, he moved 30 miles south from Baltimore to Washington, DC, to organize the chemistry department in the School of Philosophy. In addition to himself as Professor of Chemistry, Drs. Frank Cameron and Thomas M. Chatard were listed as Professors of Chemistry in 1895 (6). The name of the latter never appeared again, and Cameron resigned after two years to take a position at Cornell University (7). The published admission requirements included good moral character and studious habits. For the doctoral degree, facility in reading Latin, French, German, and others, was required before beginning the courses. No religious qualifications were required, and the tuition was one hundred dollars (6).

The Department of Chemistry announcements were introduced with the following statement (8):

(the course of study was) organized with the general aim of exciting in the student a spirit of inquiry and of training him to the habit of persistent work, and of dealing intelligently and correctly with Nature and its laws. In Chemistry, as in all other experimental sciences, progress consists in the discovery and classification of facts. Hence the student must be made acquainted with the methods of observation, and experiments; facts and the laws of Chemistry. From the very beginning of his course the greatest stress will be laid upon laboratory work; but lectures will be given regularly in General, Organic, Theoretical and Physi-



Rev. Dr. John J. Griffin

cal Chemistry and from time to time on selected topics.

The proposed listing of courses for the doctorate is given in the Table. They are similar to the courses offered currently to undergraduates in chemistry with the exception of crystallography and mineralogy, blowpipe and mineralogy, a laboratory course (8). The chemistry laboratories were located in McMahan Building, which contained many of the other departments including the other science departments. The laboratories for gas analysis, general chemistry, analytical chemistry, organic chemistry, balance room, and private laboratory were located in the basement. The lecture room, the apparatus room, the photography room, and the distilled water apparatus were

TABLE  
PROPOSED LIST OF COURSES FOR GRADUATE STUDIES IN CHEMISTRY AT THE  
CATHOLIC UNIVERSITY OF AMERICA IN 1895<sup>a</sup>

No.	Subject	Lec/Lab/week	Semester	Instructor
I	General Inorganic Chemistry	3 Lec, 2 Lec 6 Lab, 1 Rec.	1st,2nd year	Griffin
II	Organic Chemistry	2 h, 3 h	1st,2nd	Griffin
III <sup>b</sup>	Physico-Chemical Methods	2 h		Cameron
IV <sup>b</sup>	Crystallography and Mineralogy	Lec & Rec-2	year	Cameron
	Blowpipe and mineralogy	6 Lab	year	
Advanced Work				
V <sup>b</sup>	Advanced Organic Chemistry	2 h	year	Griffin
	Physical Chemistry	2 Lec	year	Cameron
VI <sup>b</sup>	Theory of Chemistry	2 h	year	Cameron
	History of Chemistry	1 h	year	Cameron
	Or VIII - Historical Chemistry <sup>b</sup> Alternating with Special Topics in Chemistry			
VII <sup>b</sup>	Legal Chemistry	10 Lec		
	Laboratory work: quantitative analysis (gravimetric, volumetric, gas & electrolytic)			
	Organic chemistry: study of difficult compounds			
	Journal Club- all members report on current principal articles			
IX <sup>b</sup>	Special Lectures- Advanced students lecture on older literature			

<sup>a</sup>Ref. 8.

<sup>b</sup>Added in 1896, Ref. 12.

on the 4th floor (9). The courses that were required before doing research for the doctorate were general chemistry, organic chemistry, crystallography and mineralogy, physical chemistry, history of chemistry, and laboratory work in quantitative analysis. The students were also required to attend the Journal Club, which was to meet once a week for examination and discussion of current publications, and special lectures given by students to acquaint their peers with the older literature (8). The Chemical Museum was located on the third floor and contained mineralogical specimens collected by Cameron, products of various refineries, and chemicals prepared by students (10). The library, which was located in the basement, was very important because "the formation of reading habit being an essential factor in the making of a chemist, all of the important chemical journals are kept on file." Friends including priests from the Archdiocese of Boston provided subscriptions to current journals (10). The *CU Bulletin* for 1896 (11) stated that nine students were doing research under Cameron and Griffin. In 1896, a new course (VIII) Legal Chemistry introduced by Griffin involved toxicological investigations. Cameron also introduced new course entitled Theory of Chemistry, (VI) 2 h/yr for which courses I to III and an "ability to follow language of calculus" were required. The topics include chemical equilibrium, theories of solutions, thermo-chemistry, electrochemistry, etc. (12). The laboratory courses (I to IV) were held for six h/wk for the whole year. The laboratory was opened from 2 - 5 P.M. every afternoon and 9 A.M. to 5 P.M. daily and Saturday, 9 A.M. to 1 P.M. for advanced students (12).

The emphasis in the laboratory work was on analytical and organic chemistry. This is in contrast to the present curriculum, where the laboratory experience in analytical chemistry is minimized. Because of the dominance of Griffin, there was an emphasis on organic chemistry in research and the laboratory courses.

In 1897, Col. Patrick B. O'Brien of New Orleans donated a sum of \$150,000 to establish three professorial chairs in chemistry, physics, and sacred science. The Patrick O'Brien Chair of Chemistry was awarded to Griffin and his Department Head successors until 1959 (13).

In 1899, only Chemistry I, General Chemistry; Chemistry II, Organic Chemistry; and Chemistry III, Advanced Work, were offered by Griffin (14).

During summer of 1900, the trolley line of the city and Suburban Railway opened along Michigan Avenue

to afford more direct communication with the city; also, it was reported that Michigan Avenue "has been graded and macadamized" (15). In this same year Julius A. Nieuwland, destined to be the first recipient of a Ph.D. in chemistry, entered the university. Born in Hansbeke near Ghent, Belgium, on February 14, 1878, he was brought by his parents to the United States two years later. In 1899, after graduating with a B.A. from Notre Dame in Indiana, he entered Holy Cross College in Washington, DC, where he pursued theological studies at the same time he embarked on his doctoral program. He was ordained in 1903 and completed his thesis, "Some Reactions of Acetylene," earning the Ph.D. degree in 1904 under the direction of Griffin (16).

After receiving his degree, Nieuwland returned to Notre Dame where he spent the rest of his life teaching and doing research in acetylene chemistry. One of his students achieved fame in another field. Knute Rockne, a high school teacher of chemistry, who was studying for a master's degree under Nieuwland, noticed an advertisement for the football coach at Notre Dame. He applied for the position, was accepted, and became a very renowned college football coach. Nieuwland continued his association with the Department of Chemistry at Catholic University, where he died of a heart attack while talking to Prof. Henry P. Ward on June 11, 1936 in Room 218 of the Maloney Chemistry Laboratory. When there were many graduate students doing research in the building, it was rumored that a ghostly figure was seen in the late hours of the night. Perhaps, it was Fr. Nieuwland returning to visit.

During Griffin's lifetime at the University, three additional doctoral dissertations were completed:

Ignatius A. Wagner, "The Condensation Products of Acetone," 1913

A. J. McGrail, "The Reactions of Calcium Carbide with the Vapors of Certain Organic Compounds," 1916

Victor A. Bast, "The Action of Calcium Carbide on Benzaldehyde and on Some Other Organic Compounds," 1918

Two additional theses were started under the direction of Griffin and completed in 1923 after his death:

Eugene P. Mullins, "The Catalytic Hydrogenation of the Condensation Products of Acetone"

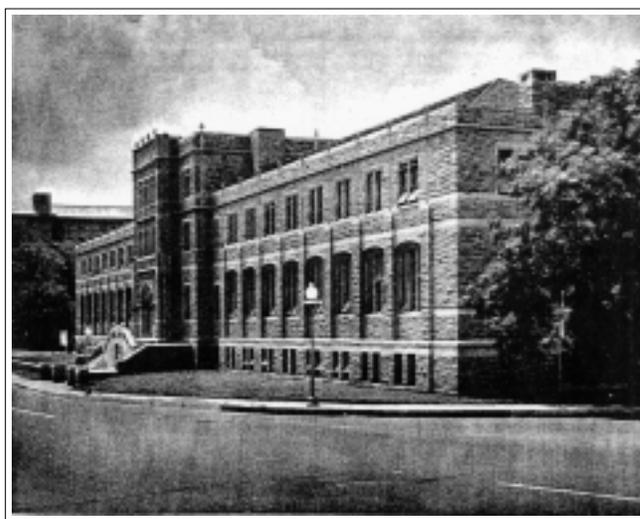
Henry P. Ward, "The Action of Hot Calcium Car-

bide on the Vapors of Some Monohydric Aliphatic Alcohols”

None of the results in these dissertations was published in chemical journals, but an abstract of Wagner’s dissertation was printed in *Chemical Abstracts* (17).

In 1902, Griffin served also as the Vice-Dean of the Faculty of Philosophy (18), becoming Dean in 1903 and promoted to Very Reverend (19). In the same year that Nieuwland completed his doctoral thesis, the University planned on starting an undergraduate program. On May 18, 1904, the rector, Denis J. O’Connell, wrote to Griffin that the “opening was deferred until (a) full picture of financial status was available” (20). In November of that year, Griffin wrote to the Board of Trustees that there would be “more activity because undergraduates encouraging to all instructors the spirit of work that would have pervaded our halls and inspired professors and students to their best efforts.” A few students were admitted (21), and the Board of Trustees endorsed the program. In the fall of 1905, 187 students were enrolled (21). All students were required to take the year of General Chemistry (22). At the present time, those students not concentrating in a science usually take a year of courses specially designed for them: Chemistry in Our Lives, Chemistry in Modern Times, and Science under Oath.

A number of courses were added in 1905: electrochemistry, gas analysis, industrial chemistry, and metallurgy because a program in chemical engineering was offered for undergraduates in the Chemistry Department. Each student was also required to do a bachelor’s thesis under Griffin’s direction. This arrangement continued until the offerings in chemical engineering were moved to the School of Engineering in 1955 with the Head of the Department of Chemistry serving as the Head until Prof. James Barclay was appointed in 1958. Griffin taught all the courses until 1910, when two assistants



Martin Maloney Chemistry Laboratory

were added, Henry B. Froning, in General Chemistry and Clarence E. Baltzley in Metallurgy. Griffin was listed for the other courses as well as serving as Dean, while John W. Rauth was Custodian of Apparatus (23). The next year Charles L. Kelly served as Instructor in Chemistry and William E. Hatcher was the Custodian of Apparatus. Griffin was not listed as Dean (24), but in 1912 he was appointed Vice-Dean of the School of Science. Henry B. Froning was an Instructor, with Clarence J. Johnson serving as Custodian of Apparatus (25). In the following year, 1913, Charles Rascher, who had received a B.S. in Chemical Engineering at the University, and Aloysius J. McGrail served as Instructors in Chemistry, A. O. Mathews as Custodian of Apparatus; Griffin continued as Vice-Dean (26). McGrail remained as an Instructor until 1919 after he had received his doctorate (27). In 1914, Patrick O’Brien was appointed Professor but remained for only one year (28). A new course, municipal chemistry, was added to the undergraduate curriculum, which dealt with water supply, sewage, food, inspections, and sanitation. Griffin gave this course with one lecture and six hours of laboratory (29).

In the summer of 1914, the newly erected east wing of the Martin Maloney Chemical Laboratory, replete with an open laboratory on the roof of the pavilion (30):

..was sufficiently completed at the time of the opening of the school year in October to permit transfer of the Department from the restricted quarters in McMahan Hall that it had occupied during the twenty years of its existence. (It is) a granite structure in the Tudor-Gothic style..and consists of a central pavilion and two wings. The pavilion contains four working floors, each having an area of 2,500 square feet and each of the two wings possesses three working floors, having a surface of 5,000 square feet each. The exterior walls are of Port deposit granite with freestone trimmings, and the interior walls are of buff-colored impervious brick. The construction is fire-proof throughout. On the ground floor are the laboratories for Metallurgy and Assaying, Industrial Chemistry, Electro-Chemistry, the Lecture Hall, unpacking and storage rooms, gas room and repair

shop.... The first floor of the pavilion is taken up entirely by a large lobby around which are grouped the show cases of the Chemical Museum. Opening into it is the first year laboratory, that of General Chemistry, which occupies the entire first floor of the east wing of the building....The corresponding floor of the west wing is devoted to the laboratory and supply rooms of Organic Chemistry...The Director's office and laboratory, together with the Chemical Library and Reading Room, occupy the second floor of the pavilion, and the laboratory of Physical Chemistry, that of Quantitative Analysis, balance room, instructors' laboratories, and a small number of rooms devoted to special methods and research take up the second floor of the wings. A smaller Lecture Hall, a Photographic laboratory, the apparatus office and stock room occupy the third floor.

When the building was renovated in the 1960s, there remained little evidence of the Chemical Museum maintained by Griffin. The remains of the mineralogical collection were donated to George Washington University. The Lecture Hall was certainly never built because a separate building connected to the Martin Maloney Chemical Laboratory was constructed in 1923. The furniture in the laboratories on the second floor was donated to the Smithsonian Museum, where some pieces were used in the display of Ira Remsen's Laboratory.

In the 1915 academic year Frederick S. Cosgrove was appointed Instructor and Griffin served as Vice-Dean of the School of Science (31). In the next year two new instructors were appointed: Philip W. Shepard and Daniel F. J. Lynch, who remained until 1919, Griffin continuing as Vice-Dean (32). In 1917 an undergraduate course in the chemistry of photographic processes was to be taught by Griffin (33). The remainder of the building was scheduled to be completed in the fall of 1917 (34).

With the imminence of the declaration of war by the United States, the military subcommittee of the Chemical Committee of the National Research Council accepted the offer of cooperation of the Bureau of Mines "to carry on investigations into noxious gases, generation and antidote for same, for war purposes, also investigations into gas masks" (35). On April 3, 1917 Charles L. Parsons initiated a census of chemists in the United States in February 1917 jointly sponsored by the Bureau of Mines and the American Chemical Society (35). He was then the chief chemist of the Bureau of Mines and Secretary of the American Chemical Society. A list-

ing of research chemists in the United States was prepared for the Chemical Committee of the National Research Council in mid-1917 by Marston T. Bogert, who had been president of the American Chemical Society in 1907-1908 (36). At the end of May, 1917, laboratories in 21 universities, three companies, and three government agencies were involved in this work involving a total of 118 chemists (37). The head of Chemical Warfare Research at the Bureau, George A. Burrell, selected American University as a research center on April 30, 1917 (37). The chemists, some of whom were in the Army, arrived in September to occupy uncompleted laboratories (37). The operation was financed by the War and Navy Departments and operated by the Bureau of Mines (38). By January of the next year there were about 200 officers and 500 enlisted men at the American University Experiment Station (39).

In 1917 the Rector of the Catholic University of America wrote to U.S. President Woodrow Wilson (40):

CATHOLIC UNIVERSITY OF AMERICA  
WASHINGTON, D. C.  
OFFICE OF THE RECTOR

March 28, 1917

Your Excellency:

In view of the present emergency, the Catholic University of America has the honor to offer itself to you for such services as the Government of the United States may desire from it.

With sentiments of profound respect, I have the honor to remain,

Very faithfully yours.

THOMAS J. SHAHAN,  
Rector

His Excellency Woodrow Wilson  
*President of the United States*  
The White House  
*Washington, D. C.*

The President responded as follows:

THE WHITE HOUSE  
WASHINGTON

March 30, 1917

MY DEAR BISHOP SHAHAN

Let me thank you warmly for your generous letter of March 28. I am very grateful to you for your pledge of cooperation and support.

Cordially and sincerely yours

WOODROW WILSON

RIGHT REVEREND THOMAS J. SHAHAN  
Rector  
Catholic University of America  
Washington, D. C.

About January 15, 1918, Dr. W. Lee Lewis, Associate Professor of Chemistry at Northwestern University and Captain in the U.S. Army, was sent to establish a new unit (Organic Unit No. 3) of the Offense Research Section of the Experiment Station in the Martin Maloney Chemistry Laboratory. This was a result of the Shahan-Wilson correspondence and the association between Griffin and Col. J. F. Norris, who had done graduate work together at Johns Hopkins University (40). Norris was the commander of the American University Experiment Station. The site was also selected because of the "adequate laboratory space" given to the unit, "the excellent library, one of the finest in the country, and the superior appointments of the building together with the cordial attitude of the staff" (40). The mission was the discovery and development of new offense weapons. Another segment of the Offense Research established at this time was the Research Analytical Unit, which was concerned with the development of analytical methods for new compounds and analysis of materials that could be done with ordinary procedures. The Catalytic Unit was concerned with preparing fluorine and fluorinated derivatives, ethylene tetrachloride, acetic acid, and chlorinated and brominated ethers. The Dispersoid Section worked on the dispersion of toxic solids. From June 17, 1918 to January 1, 1919, a unit of the Defense Research Section, concerned with the preparation of clothing for protection against war gases, was stationed in the building. As the number of personnel grew, a Safety Department was established. This service unit

included a nurse, a driver, a telephone operator, an orderly, and a policeman in addition to safety engineers. The unit was closed on January 1, 1919 (40). On June 25, 1918, the Experiment Station was transferred from the Bureau of Mines to the War Department. Three days later, the Chemical Warfare Service was founded as part of the National Army (41).

The principal project of Organic Unit No.3 was initially concerned with the production of mustard gas. This work was done at American University because the hood ventilation at the Martin Maloney Chemical Laboratory was poor (42). Dr. R. R. Williams, previously with the Bureau of Mines, worked with the unit for two months in 1918 to isolate ricin from castor beans. This extract, highly toxic to animals, had been isolated in 1905 (43). It was presumably prepared to be used on the enemies' horses, which were used in transportation of guns, etc.

About April 13, 1918, a quantitative study of the reaction of acetylene with arsenic trichloride, which had been described by Nieuwland in his thesis, was initiated. The observation appeared in Nieuwland's thesis as follows (44):

### Arsenic Trichloride ( $AsCl_3$ )

Pure arsenic trichloride free from oxide did not show any reaction with perfectly dry acetylene. When aluminum chloride was added the absorption of the gas was effected with the evolution of considerable heat. The contents of the flask turned black. When decomposed by pouring the substance into cold water, a black gummy mass separated out, and on standing for some time crystals appeared in the aqueous solution. The tarry substance possessed a most nauseating and penetrating odor, and was nauseating and penetrating odor, and was extremely poisonous. Inhalation of the fumes, even in small quantity cause nervous depression. No chlorine derivatives of acetylene were noted. Owing to the poisonous nature of the compounds formed, their thorough investigation was postponed.

The reaction involves the synthesis of dichloro (*trans*-2-chlorovinyl)arsine with aluminum chloride as the catalyst. The product, a potent blister agent with a geranium-like odor, was named lewisite. It was designated Agent L and manufactured in Willoughby, OH. Mustard gas ( $[(ClCH_2CH_2)_2S]$  is also a blister agent with a weak, sweet, and agreeable odor. A eutectic mixture of lewisite and mustard designated HL was used also a blister agent. A shipment of lewisite was on the high seas to Europe when the armistice was signed. The U.S. Navy

sank the vessel at sea (45). Although its existence was kept secret during the war, several papers describing the reactions were published in the 1920s (46). Most of the chemists left at the Organic Unit No.3 by December 15, 1918, and the unit was formally closed on January 1, 1919 (40).

Cpl. Henry P. Ward was one of the chemists working on these projects. After he was discharged from the U.S. Army, he entered the graduate program in chemistry at Catholic University. His forty-four year association terminated when he retired as an Ordinary Professor in 1962. When there was construction of new buildings near the Maloney Chemistry Laboratory during the 1960s, he was concerned that lewisite might still be present in containers buried behind the building after World War II. These fears were unfounded, as no evidence of these containers was unearthed. However, the paint on the ceilings in some of the rooms in the building continually peeled because of to the hydrolysis of the absorbed lewisite. The ceilings are now hidden by the false ceilings installed during the renovation of the building in the 1960s.

In 1919, Lynch and McGrail were replaced as instructors by Thomas F. Power and Ward, with Griffin serving as Vice-Dean of the School of Sciences (47). Eugene P. Mullins replaced Power in 1921 (48). Griffin (48) was no longer Vice-Dean but served as a delegate from the School of Sciences to the Academic Senate of the University. The next year after Griffin died, Dr. Hardee Chambliss replaced Griffin as Patrick O'Brien Professor of Chemistry and Head of the Department of Chemistry (49). There were twelve candidates for advanced degrees listed in 1921(50). This number is considerably higher than in previous years where the number was about three to five.

The early years of the Chemistry Department from 1895 to 1921 were dominated by Griffin. Initially the department was established as a graduate program and in 1905, undergraduate studies in chemistry and chemical engineering were introduced. Throughout the period of 1897 to 1921, Griffin was the only professor, assisted in many years by one or two instructors. He was the sole research supervisor for the chemistry graduates and the chemical engineering undergraduates. During this period, he supervised four doctoral and about twenty Master dissertations. All of the research was in the area of organic chemistry, which was the major interest of Griffin.

## ACKNOWLEDGMENT

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