

HISTORY OF THE

Chemical Engineering Program

at Clarkson University

YEARS

100



100 Years of Service to the Profession

This document was prepared by the Centennial Celebration Committee consisting of R. Shankar Subramanian (Chair), Sandra L. Harris, and William R. Wilcox, with assistance from a large number of individuals, including Ross Taylor, Chair of the Department of Chemical Engineering, and other current and retired faculty members, the Alumni Office, the Student Administrative Services, the Office of Marketing/ Communications, especially Renee Holsen, and the Human Resources Office at Clarkson. Also, valuable assistance was provided by Clarkson library staff, especially Iva Ramsdell, who maintains the Clarkson archives.

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“Clarkson University

was founded by three sisters as a memorial to their brother, Thomas S. Clarkson, a local businessman and humanitarian who was accidentally killed in his sandstone quarry in 1894 – Chemical Engineering was inaugurated at the Thomas S. Clarkson Memorial School of Technology in 1903, and the first chemical engineering degree was awarded in 1904.”

— excerpt from “Ch.E. Department Clarkson University”
by Robert Cole and Don Rasmussen, *Chemical Engineering Education*,
Summer 1988, pages 110-114.

INTRODUCTION

Thus began the program in chemical engineering at The Clarkson School, which subsequently transformed into Clarkson College of Technology and later, Clarkson University. The first graduate was Frank Casper Zapf, who received a Bachelor’s degree in Chemical Engineering in 1904. Mr. Zapf joined the General Electric Company on April 10, 1905, after a brief period at St. Regis Paper Company in St. Regis Falls, New York. He spent 42 years at General Electric, retiring as Assistant to the Sales Manager of the Resin and Insulation Materials Division on May 1, 1947 (see page 3 for more details about our first graduate). The first Master’s degree was granted in 1922 to Kenneth Fleming Cruikshank. At that time, the M.S. degree was awarded to those who had a B.S. and had completed a year of satisfactory work in residence. Also, a degree known as “Chemical Engineer” was awarded in the early days of the program to individuals with a B.S. who had completed three years of acceptable professional practice, and who submitted a thesis and subsequently attended the Commencement ceremony; the first recipients of this degree were Floyd Hamilton Fish and George Spencer Lobdell, also in 1922. The first research-based M.S. degrees were awarded in 1951 to John James DeGouff, Jr. and Ronald T. Steinberg. The first doctoral degree at Clarkson College of Technology, as it was known at that time, was granted in Chemistry in 1964, and this was followed in 1965 with the first Ph.D. degrees granted in Chemical Engineering to James Louis Allen and Neil Westcott Cayey. These two Departments were leaders in recognizing the importance of research and graduate education at Clarkson, and developing substantial research efforts in the early days when Clarkson was primarily an undergraduate institution.

A Centennial Celebration of Chemical Engineering at Clarkson

1904



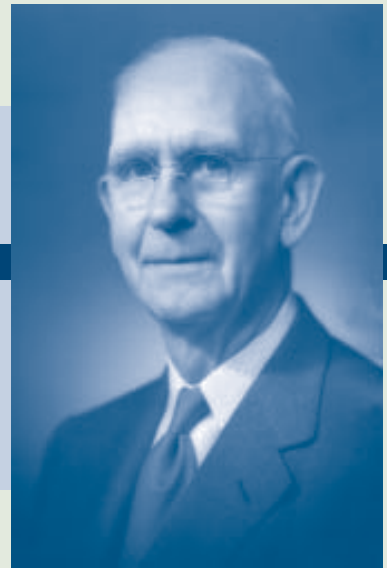
Chemical Laboratory in the early years

Another landmark in the program's history was the granting of the first Bachelor's degree to a woman. Even though The Clarkson School admitted women when it was first established, there appear to have been no women admitted to the engineering programs. Women entered the engineering undergraduate program at Clarkson only in the late sixties, and our first women graduates, Sheila M. Albrecht, Barbara M. Baum, and Nancy J. Muroski, were awarded B.S. degrees in Chemical Engineering at the Commencement exercises in 1971. At the graduate level, the Department enrolled women beginning in the mid-sixties, when the graduate program began to expand. In 2003, women comprise 27% of the undergraduate population, and 17% of the graduate student body, in Chemical Engineering.

In Fall 1929, two faculty members (Hecker from Chemical Engineering and Rude from Chemistry) organized a student group titled "Chemical Club" and in 1931, this became the Lucius K. Russell Student Chapter of the American Institute of Chemical Engineers, in honor of Professor of Chemistry Lucius Kimball Russell, who was appointed Professor Emeritus in 1931-32. In 1940, the Delta Chapter of the Chemical Engineering Honor Society, Omega Chi Epsilon, was inaugurated at Clarkson.

As of June 2003, 3,329 Bachelor's, 350 Master's, and 172 Doctoral graduates have been educated by the Chemical Engineering program at Clarkson, and they have gone on to pursue successful, and in many cases, distinguished careers. This document provides a brief history of the program, highlighting some milestones.

1904 — Frank Casper Zapf received the first Bachelor of Science degree in Chemical Engineering from Clarkson



1ST CHEMICAL ENGINEERING DEGREE

FRANK CASPER ZAPF

Frank Casper Zapf was born in Great Bend, New York. He attended high school in Carthage, New York, and entered Clarkson College in 1900. He initially was enrolled as a Chemistry major through his junior year, but became a Chemical Engineering major in his senior year, graduating with the first degree in Chemical Engineering from Clarkson in 1904. After graduation, he spent a brief period at St. Regis Paper Company in St. Regis Falls, New York, and then joined General Electric Company in Schenectady, New York, on April 10, 1905, starting in the chemical section of the testing laboratory. In October 1906, he was transferred to the Research Laboratory, and in 1909, he became assistant to L.E. Barringer, engineer of insulation for General Electric, working on the development of varnishes and varnished cloth. He assisted in the development of some of the first black insulating varnishes for cloth coating and other types of black varnishes. He also worked on problems of bias cut cloth, used at that time in electrical insulation. He rose through the ranks and retired on May 1, 1947, as Assistant to the Sales Manager of the Resin and Insulation Materials Division, after 42 years of service with General Electric. He is reported to be one of the original pioneers in the development of electrical insulation at the company.

Zapf was secretary of the Clarkson Alumni Association in the early years after graduation, and served Clarkson later as a member of the Board of Trustees during the period 1950-1955.

The information about Zapf's career is reproduced from an article that appeared upon his retirement in "Plastics Division News" of the General Electric Company, published in Pittsfield, Massachusetts, May 9, 1947.

1908-1931



Lucius K. Russell —
Chemical Engineering
Faculty Member from
1908 to 1931



Student working in the Chemical
Laboratory

THE PROGRAM

Chemical Engineering was inaugurated in 1903 within the Chemistry Department, and was initially housed in a building known fondly as Old Main. The February 1904 *Bulletin of Clarkson School* describes the program as follows.

“The instruction in this course is designed to be such as will give the student a thorough grounding in the fundamental principles of engineering, together with such training in chemistry — general, analytical and industrial as will enable him to be of service in the design, construction, and operation of chemical plants and the development of processes involving a knowledge of chemistry. During the last two years of the course considerable opportunity is given the individual student of selecting work along those particular lines which he intends to follow after graduation.”

The course of study required students to earn 142 semester credit hours for the baccalaureate degree, each semester hour credit being given for one lecture or recitation, per week, for a semester of eighteen weeks, or for a practice period of three hours per week for the same length of time. Each student had to write a thesis based on work amounting to five credit hours. The program, requiring eight semesters of study, included liberal arts, mathematics up to differential equations, a good dose of chemistry and physics, and several engineering courses and laboratories. The annual tuition during the 1903-04 year is listed as \$100. The complete undergraduate curriculum is displayed on page 8. The program of study has evolved with the times, and the program in 2003-04 is listed on page 9 for comparison.

1922

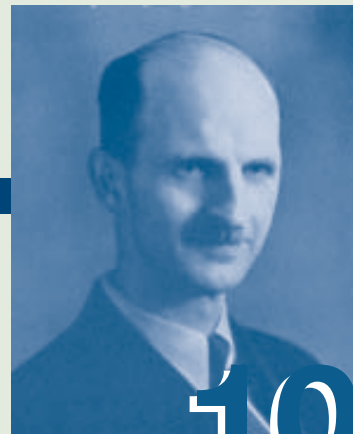


Kenneth Fleming Cruikshank — First Master of Science Graduate in Chemical Engineering



George S. Lobdell — Chemical Engineering Faculty Member from 1916 to 1929; also one of the two first recipients of the “Chemical Engineer” degree in 1922

Francis H. (Daddy) Reynolds — Chemical Engineering Faculty Member from 1925 to 1965



1925

For nearly three decades, chemical engineering courses were listed together with Chemistry courses in the *Bulletin*. In the 1927 *Bulletin*, three new courses, Chemistry 415, 425, and 435, labeled “Chemical Engineering,” all taught by Francis Reynolds, appeared within the listing of Chemistry courses. Beginning with the 1930 *Bulletin*, chemical engineering courses were listed separately, even though the program was still within the Chemistry Department. Chemical Engineering eventually became a separate department in 1958, and Herman L. Shulman was appointed as the first Chairman.

In the early period of the program, Clarkson undergraduates routinely participated in the AIChE National Student Design Competition, winning the First Prize in 1941, and again in 1948, as well as other prizes and several honorable mentions. The 1941 first prize winning solution by E. Bruce Powell was reported in Section A of the *Transactions of the AIChE* Vol. 37, No. 3, 433-474 (1941). In fact, Weller R. Pierce from Clarkson won the second prize that year.



Charles H. Hecker — Chemical Engineering Faculty Member from 1929 to 1958

1929

1931



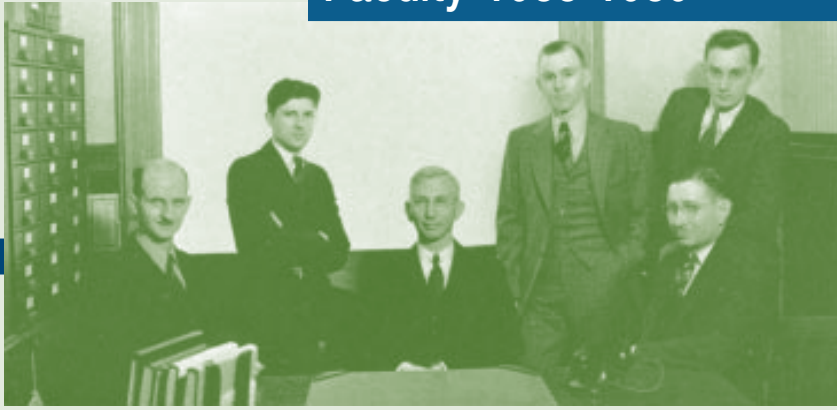
The Lucius K. Russell Student Chapter of the American Institute of Chemical Engineers in its inaugural year

AICHE
NATIONAL STUDENT
DESIGN COMPETITION

Clarkson students who received recognition in the AIChE National Student Design Competition.

STUDENT	AWARD	YEAR
Donald C. Graham	Honorable Mention	1938
Leroy N. Chellis	Third Prize	1940
E. Bruce Powell	First Prize	1941
Weller R. Pierce	Second Prize	1941
J. Lawry Bennetts	Honorable Mention	1943
Jack E. Wilber	First Prize	1948
Sanford Baranow	Honorable Mention	1950
Lawrence Ansell	Honorable Mention	1950
Foster W. Rennie	Honorable Mention	1951
James L. Hanchette	Honorable Mention	1954
Stephen C. Winans	Honorable Mention	1963
Allyn M. Davis	Honorable Mention	1964
Bruce G. Meyer	Honorable Mention	1969

Faculty 1938-1939



Chemical Engineering and Chemistry Faculty Members in 1938-39 — Seated left to right are faculty members Reynolds, Cunningham (Chemistry), Hecker, and Atkin (Chemistry), and standing left to right are Winnicki and Brownell (Chemistry)



1941-1943

Frederick P. Ciambrone —
Chemical Engineering Faculty
Member from 1941 to 1943

1943

“The committee has selected as winner

of the A. McLaren White Award which is the first prize – Mr. E. Bruce Powell, Clarkson College of Technology. As second prize winner we have selected – Mr. Weller R. Pierce also of Clarkson College of Technology.

Since only two entries are allowed from each student chapter, another institution had to win third prize.”

— excerpt from W.T. Dixon, p. B55 of the *Transactions of the AIChE*,
Vol. 37, No. 3 (1941)

Curriculum Comparison

1903 -1904 CURRICULUM

FRESHMAN YEAR.

I. SEMESTER.		II. SEMESTER.	
	Semester hours per week		Semester hours per week
English 1.....	1	English 2.....	1
French 1 or German 1.....	5	French 2 or German 2.....	5
Theory of Equations (Math. 1) {	5	Conic Sections (Math. 4) {	5
Trigonometry (Math. 2) }		Calculus (Math. 12) }	
Chemistry 1.....	4	Qualitative Analysis (Chemistry 2).....	4
Mechanical Drawing (Drawing 31).....	3	Elem. of Eng'g Construction (M. E. 8.).....	3
Woodworking (Shopwork 3).....	1	Woodturning (Shopwork 6).....	1
	<u>18</u>		<u>18</u>

SOPHOMORE YEAR.

French 3 or German 3.....	3	Economics 1.....	2
Differential Calculus (Math. 5).....	5	Integral Calculus (Math. 6) {	5
Analytic Geometry (Math. 13) }	3	Differential Equations (Math. 7) }	
Solid Anal. Geometry (Math. 14) }		3	Physics 2.....
Physics 1.....	5	Physical Laboratory (Physics 12).....	1
Physical Laboratory (Physics 21).....	1	Elements of Mechanism (M. E. 11).....	3
Descriptive Geometry (Drawing 33).....	3	Surveying (C. E. 2) {	1
Surveying (C. E. 1) }	1	Field Practice (C. E. 22) }	
Field Practice (C. E. 21) }		1	Ironwork (Shopwork 10) {
Forging (Shopwork 4, 5).....	3	Machine Toolwork (Shopwork 11) }	
	<u>18</u>		<u>18</u>

JUNIOR YEAR.

I. SEMESTER.		II. SEMESTER.	
Sociology.....	1	Applied Mechanics (Mechanics 2).....	4
Theoretical Mechanics (Mechanics 1).....	4	Iron and Steel (Mechanics 4).....	1
Experimental Mechanics (M. E. 20).....	1	Lab'y of Applied Mechanism, (M. E. 21).....	1
Electricity and Magnetism (E. E. 1) {	3	Iron Analysis (Chemistry 24).....	1
Dynamo-Electric Machinery (E. E. 2) }		1	Metallurgy of Iron and Steel (Mining 5).....
Electrical Laboratory (E. E. 21).....	2	Economic Geology (Mining 2).....	1
Steam Engineering (M. E. 10).....	3	Mineralogy (Mining 3).....	3
Steam Generation (M. E. 4) {	4	Quantitative Analysis (Chemistry 20).....	3
Organic Chemistry (Chemistry 3).....		4	Industrial Chemistry (Chemistry 4).....
Coal Analysis (Chemistry 25).....	1		<u>18</u>
	<u>18</u>		

SENIOR YEAR.

Laws of Operations and Contracts, (Economics 5, 6).....	2	Engineering Economics (Economics 2).....	1
Hydraulics (Mechanics 3).....	3	Electric Power (E. E. 13).....	1
Water Analysis (Chemistry 23).....	1	Assaying (Mining 26).....	1
Cement Testing (Chemistry 28).....	1	Organic Analysis (Chemistry 27).....	1
Advanced Quantitative Analysis.....	2	History of Chemistry (Chemistry 5).....	1
Physical Chemistry (Physics 4).....	3	Electro-Chemistry (Chemistry 6).....	2
Electrical Distribution (E. E. 7).....	3	German Seminar.....	1
Seminar.....	1	Thesis.....	5
Chemical Preparations.....	3	Elective.....	3
	<u>17</u>		<u>17</u>

1903-1904

2003 -2004 CURRICULUM

FRESHMAN YEAR

First Semester		Second Semester	
<i>Course Title</i>	<i>Cr. Hrs.</i>		
CM131 General Chemistry I	4	CM132 General Chemistry II	4
LS195 Great Ideas I	3	LS196 Great Ideas II	3
MA131 Calculus I	3	MA132 Calculus II	3
PH131 Physics I	4	ES100 Introduction to Engineering Use of the Computer	2
	<hr/> 14	PH132 Physics II	4
			<hr/> 16

SOPHOMORE YEAR

First Semester		Second Semester	
CH250 Chemical Process Calculations	3	CH272 Applied Phase & Chem. Equilibria	3
CH271 ChE Thermodynamics	3	CM372 Physical Chemistry II	3
CM371 Physical Chemistry I	3	MA232 Differential Equations	3
MA231 Calculus III	3	Foundation Liberal Arts Course Elective ¹	3
MS/AS Military Science/Aerospace Studies (if elected) ²	1	MS/AS Military Science/Aerospace Studies (if elected) ²	1
	<hr/> 15 or 16		<hr/> 15 or 16

JUNIOR YEAR

First Semester		Second Semester	
CH301 Fluid Mechanics	3	CH302 Heat Transfer	3
CH351 Mass Transfer and Stagewise Operations	3	CH485 Process Dynamics and Control	3
CM241 Organic Chemistry I	3	CM242 Organic Chemistry II	3
CM390 Chemistry Laboratory or Elective ¹	3	Elective ¹ or CM390	3
Foundation Liberal Arts Course (EC350 Principles of Micro & Engineering Economics)	3	Foundation Liberal Arts Course	3
	<hr/> 15	CH310 ChE Laboratory I	1
			<hr/> 16

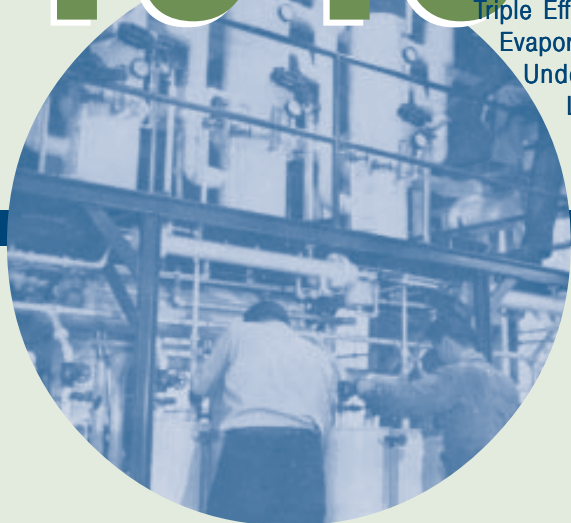
SENIOR YEAR

First Semester		Second Semester	
CH480 Design I	3	CH481 Design II	3
CH345 Chemical Reactor Analysis I	3	Electives ¹	12
Foundation Management Course	3		<hr/> 15
Elective ¹	3		
CH410 ChE Laboratory II	2		
	<hr/> 14		

- The seven elective courses must be approved by the student's faculty adviser and must be distributed as follows: Two courses (each from a different field) among materials science, electrical science, and mechanics; one course in mathematics; two courses in engineering, science, or mathematics; two undesignated electives. An "undesignated elective" is any course that does not contain a significant amount of material already covered in the student's program.
- Six credits of military science or aerospace studies may be used to satisfy the requirement for two undesignated electives.

1946

Triple Effect
Evaporator in the
Undergraduate
Laboratory in
1946



Faculty 1949-1950



Faculty including Graduate Teaching Assistants 1949-50 – Seated left to right are faculty members Reynolds, Hecker, Frishe, and Shulman, and standing left to right are Teaching Assistants Zimmerman, Steinberg, and DeGouff; Steinberg and DeGouff were the first two recipients of the research-based Master of Science degree subsequently in 1951.

THE FACULTY

A listing of all the faculty members and the period during which they served in that capacity appears on pages 24 and 25. A brief historical overview is provided below.

Initially, instruction in chemical engineering was provided by Frank Marion Williams, who is listed as Professor of Chemistry and English in the 1898-99 *Clarkson Bulletin*. The 1900-01 *Bulletin* lists him as Professor of Chemistry and Geology. In subsequent years, he is listed as Professor of Chemistry. In 1908, Professor Williams resigned, and Lucius Kimball Russell, a graduate of MIT (S.B.) and Columbia University (A.M.) was appointed as Professor of Chemistry, and presumably provided instruction in chemical engineering courses. It can be surmised from the *Clarkson Bulletins* that some other individuals provided instruction in Chemical Engineering, but had appointments in Chemistry. One of these was George Spencer Lobdell, who received a B.S. in Chemical Engineering from Clarkson in 1916, and appears in the October 1916 *Bulletin* as Instructor in Chemistry. In 1922, Lobdell was one of the two first recipients of the Chemical Engineer degree. The January 1924 *Bulletin* lists Lobdell as Assistant Professor of Chemistry. Subsequently, Francis Hastings Reynolds is listed in the January 1926 *Clarkson Bulletin* as Instructor in Chemistry. Reynolds received a B.S. in Chemical Engineering from Clarkson in 1923, and later the Chemical Engineer degree in 1927. The first faculty member to hold a formal appointment in Chemical Engineering was Charles Hecker (Ch.E., 1909, M.A., 1911, Ph.D., 1913, U. Cincinnati), who was appointed Professor of Chemical

Note: Not all faculty members in a given year were present for the photographs, and in some cases, the photographs include graduate students who served as instructors on a short-term basis.

1951-1952



Faculty members Hill (l), Bro

Faculty 1955-1956



Faculty 1955-56 — Seated left to right are Cole and Green, and standing left to right are Shulman and Reynolds

1947-1948



Peyton Hall

Engineering during the 1929-30 year. In the April 1930 *Bulletin*, Reynolds still is listed as Instructor in Chemistry, and Lobdell is no longer listed as a faculty member. The next *Bulletin* in April 1931 lists Reynolds as Assistant Professor of Chemical Engineering. During the 1937-38 year, Henry S. Winnicki joined as Instructor and was promoted to Assistant Professor in 1939-40. It appears that he left shortly thereafter, because he is not listed among the faculty after 1941 in the *Bulletin*. Frederick P. Ciambro (Ch.E.) served as Instructor in Chemical Engineering for a brief period between the 1941-42 and 1943-44 years. Reynolds rose through the ranks to become Professor of Chemical Engineering sometime between 1943 and 1945, and was known fondly as “Daddy” Reynolds, a nickname that he earned during his earlier student days at Clarkson. Morse Hill served as Instructor in Chemical Engineering for approximately one year between 1947 and 1948.

In 1948, Herman L. Shulman joined the program as Assistant Professor. Shulman was the first chemical engineering faculty member to hold a Ph.D. in Chemical Engineering. William C. Frishe joined the faculty in early 1949, but left in August 1950. Per Bro joined in August 1951 and left in June 1952. Other appointments during the fifties included Duane Green, Robert Cole and Thomas J. Ward. Duane Green, in fact, first served on the chemical engineering faculty during the 1946-47 academic year, but his name is not listed among the faculty in the next available *Bulletin*, which is dated September 1948. It appears that he left Clarkson somewhere between 1947 and 1948, and rejoined the faculty in 1953. As noted earlier, when Chemical Engineering was established as a separate Department in 1958, Herman L. Shulman was appointed as the first Chairman. Shulman also became Director of

Faculty 1961-1962



1958

Herman L. Shulman — Chemical Engineering Faculty Member from 1948 to 1988 and first Chairman of the Department of Chemical Engineering when it became a separate Department in 1958



Faculty 1961-62 — Seated left to right are Reynolds, Shulman, and Estrin, and standing left to right are Cole and Ward

the Division of Research (the name used for the Office of Sponsored Research at Clarkson) in the same year. Joseph Estrin joined the Department in 1960, followed by Gordon R. Youngquist in 1962 and Robert A. Shaw in 1964. By 1964, Shulman was Dean of the Graduate School and Director of the Division of Research; therefore, he stepped down from the position of Chairman of Chemical Engineering. Joseph Estrin became Chairman, and served in that capacity for one year. In 1965, William N. Gill from Syracuse was appointed as Chairman. The Department went through a major transformation during the next six years under Gill's leadership. Shulman and Gill applied to the National Science Foundation and won an award of \$590,000 in 1969 targeted toward the development of the program in Chemical Engineering. Distinguished individuals came to campus for extended visits during Gill's tenure as Chairman. Some examples are Eli Ruckenstein, who spent the 1969-70 year at Clarkson as a National Science Foundation Visiting Foreign Scientist, T. Brooke Benjamin, who spent the spring semester 1970 as a Distinguished Visiting Professor, and L.E. Scriven, Richard Bellman, and Howard Brenner, each of whom gave a series of several lectures between 1968 and 1970. The Department also was able to expand its graduate program by increasing the size of the faculty substantially, using the NSF grant to initiate that expansion. The number of graduate students in residence in September 1969 was 45. By 1971, the faculty had nearly doubled in size to 13 full-time faculty members. New arrivals during this period include John H. Beamer, Andrew F. Burke, David O. Cooney, E. James Davis, Edward W. Graham, Joseph L. Katz, and Chien-Shih Lu. Also, Jose A. Blanco served on the faculty for a brief period (1966-67).

In September 1971, Gill left Clarkson to become Provost of Engineering and Applied Sciences at the State University of New York at Buffalo. During the period from 1971 to 1975,



Blanco



Lu

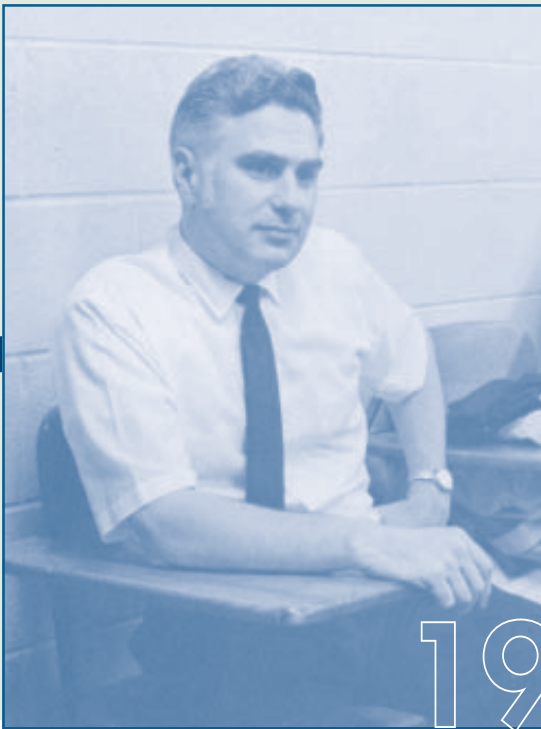
1965



**James Louis Allen and
Neil Westcott Cayey (left)
— First Doctor of
Philosophy Graduates in
Chemical Engineering**



Joseph Estrin, E. James Davis, and Richard J. Nunge, successively occupied the Chairman's position on an interim basis. In that time window, Der-Tau Chin, Sudarshan Suneja, R. Shankar Subramanian, and Vincent Van Brunt joined the faculty. In 1975, the Department attracted William R. Wilcox, then at the University of Southern California, to join as the Chairman, a position he occupied until June 1986. Under Wilcox's leadership, the undergraduate and graduate enrollments grew strongly, as did the size of the faculty. The total number of undergraduates in the program was 260 during the 1975-76 academic year, and peaked at 486 during the 1982-83 academic year. The graduate enrollment grew from 35 during the 1975-76 academic year to an all-time maximum of 76 during the 1985-86 academic year, and the number of full-time faculty members increased in the same period from 10 to 18. The new faculty members that joined the Department during Wilcox's tenure as Chairman are Michael G. Antoniadis, S.V. Babu, William L. Baldewicz, Ruth E. Baltus, Gregory A. Campbell, Marc D. Donohue, Sandra L. Harris, Angelo Lucia, Richard J. McCluskey, John B. McLaughlin (a move from the Physics Department), Nsima T. Obot, Don H. Rasmussen, Peter C. Sukanek, Ross Taylor, Thomas L. Wayburn, and Ralph H. Weiland. Among these faculty members recruited under Wilcox's leadership were the first two women faculty members of the Department. In 1986, when Wilcox resigned as Chairman to become director of the newly established "Center for Advanced Materials Processing (CAMP)" and the "NASA Center for the Commercialization of Crystal Growth in Space," R. Shankar Subramanian was appointed Acting Chair,



William N. Gill, Chairman from 1965 to 1971 and a key contributor to the growth of the national stature of the Department. During his tenure as Chairman, the Department received a Development Grant of \$590,000 from the National Science Foundation targeted toward that growth.

1965-1971

effective July 1, a position that he occupied for six months, before being appointed Chair in January 1987. In July 1987, Wilcox was appointed Dean of Engineering, a position in which he served until June 1996, at which time he assumed the responsibilities of a full-time faculty member. Subramanian served as Chair until June 1996. During this period, two new faculty members, S. Ted Oyama and Ian I. Suni, joined the Department, and a number of individuals spent brief periods on the campus as Distinguished Visiting Scholars, giving research seminars and holding discussions with our faculty members and students. The list includes George Batchelor, Howard Brenner, Costel Denson, Elizabeth Dussan V., David Jeffrey, R. Krishna, E.M. Sparrow, Warren Stewart, and J.A. Wesselingh. Subramanian also oversaw the move of the entire Department from Peyton Hall to its new home in the Center for Advanced Materials Processing (CAMP) Building, and a significant growth in the Ph.D. production rate, even though the undergraduate and graduate enrollments, along with the faculty size, decreased during the period 1986-96. When Subramanian resigned effective June 30, 1996, to assume full-time responsibilities as a faculty member, Gregory A. Campbell was appointed Chair, a position in which he served for two-and-a-half years. Effective October 1, 1998, Campbell was named Dean of Engineering, and served in that capacity until the end of June 2000, at which time he returned to the Department to assume responsibilities as a full-time faculty member. In January 1999, Ross Taylor was named Chair. During his tenure, the Department recruited Philip Hopke (a move from Chemistry) and Raghunathan Rengaswamy.

Several faculty members spent their entire careers at Clarkson, while others moved on to accept positions elsewhere. Many of our faculty members have served in a variety of administrative and research leadership positions at Clarkson. Such offices held by our faculty members, after



Left: Undergraduate Laboratory in Peyton Hall in 1963

Undergraduate Laboratory in Peyton Hall in 1969



Chemical Engineering became an independent Department separate from Chemistry, are summarized next. Shulman served as Dean of the Graduate School, Associate Director and later Director of the Division of Research, Dean of Engineering, Vice President, Executive Vice President, Provost, and Acting President, during various periods of his tenure at Clarkson, and in many ways, influenced the development of Chemical Engineering for a long period after he resigned as Chairman. Nunge served as Dean of the Graduate School and Director of the Division of Research; Wilcox was Dean of Engineering, founding Director of the Center for Advanced Materials Processing, and Director of the NASA Center for the Commercialization of Crystal Growth in Space; he currently serves as Associate Director of the International Center for Gravity Materials Sciences and Applications. Campbell has served as Director of Campus Information Services and as Dean of Engineering. Babu serves as Director of the Center for Advanced Materials Processing and Vice Provost for Research, and Hopke is Director of the Center for Air Resources Engineering and Science (CARES). Rasmussen served as Director (and Associate Director, earlier) of the Institute of Colloid and Surface Science, while Subramanian served as the Associate Director of that Institute.

Some faculty members went on to chair other chemical engineering departments, either immediately or later in their careers. Individuals in this list include David Cooney (U. Wyoming), James Davis (U. New Mexico), Marc Donohue (Johns Hopkins U.), Joseph Estrin (U. Rhode Island), Joseph Katz (Johns Hopkins U.), and Peter Sukanek (U. Mississippi).

Throughout the period of its existence, the Chemical Engineering Department has been ably served by its support staff, consisting of secretarial personnel and technicians. A complete record of names of these individuals is not available, and, therefore, it is not possible to mention everyone who served in this capacity by name.

1971



Sheila M. Albrecht, Barbara M. Baum, and Nancy J. Muroski – First women Bachelor of Science Graduates in Chemical Engineering

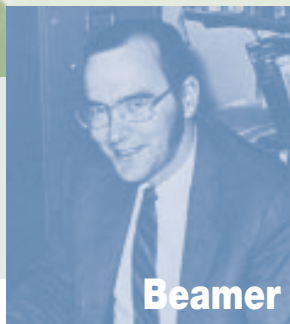
FACILITIES

Initially, chemical engineering was housed in “Old Main” on the downtown campus. The laboratories were presumably housed within the same building. Eventually, in the late thirties, the chemical engineering laboratories were moved to Sutherland Hall, a separate building directly behind Old Main. According to the 1939 *Bulletin*, the Chemical Engineering Laboratories comprised a main laboratory, a combination control and metallographic laboratory, a darkroom, a stock room, and an office. The main laboratory occupied a floor space of 1,950 sq. ft. and one half of this area was available for set-ups taller than one story. During the year 1948-49, chemical engineering moved to a new three-story building on the downtown campus, named Peyton Hall, eventually expanding to occupy the entire building. Quoting from the article by Cole and Rasmussen in *Chemical Engineering Education* in 1988,

“Since 1948, chemical engineering has been located in Peyton Hall, a three-story structure having a total of 32,000 square feet of floor space. Originally, the building contained the college library on the third floor and strength of materials and machine tool laboratories on the first floor. The unit operations laboratory occupied the second floor, and the traditional well, which occupied 1,650 sq. ft. of floor space on the ground floor, rose the entire height of the building. By the mid 1960s, chemical engineering was the exclusive occupant of Peyton Hall, and with the continuous expansion of the graduate program and increase in faculty size, many modifications of the interior have been required in order to provide sufficient laboratory and office space. The most significant of these have perhaps been the covering over of the well at the third floor level to create research laboratories, the partial covering of the well on the second floor to create both faculty offices and research laboratories, and the renovation of the basement area to create additional laboratories. Today, the building houses 21 faculty offices, 27 laboratories, two departmental offices, two 50-student classrooms, a computer laboratory for the design course, a computer terminal room for the graduate students, the departmental machine shop, and the chemical engineering senior laboratory which still occupies a major portion of the second floor plus the well.”



Burke



Beamer

Faculty 1972-73



Faculty 1972-73 — Seated left to right are Cole, Graham, Katz, Ward, Estrin, Cooney, Davis, and Shaw, and standing left to right are Youngquist, Bryner, and Suneja

1973

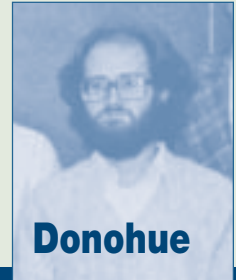
In 1991, the Department moved to its present home in the CAMP (Center for Advanced Materials Processing) Building. A campaign was initiated along with this move to upgrade the undergraduate laboratory equipment, and with the generous support of the Keck Foundation and several companies that recruit our graduates, a sum in excess of \$ 375,000 was raised for this purpose, permitting the Department to purchase and install a continuous glass distillation column, an evaporator, an extruder, a microcontamination experiment and a pH control experiment, and other miscellaneous items of laboratory equipment.

The CAMP Building, and the contiguous Rowley Laboratories house all of the engineering departments. The complex also houses a number of research centers, and non-engineering faculty members associated with these centers. The Chemical Engineering Department occupies approximately 28,000 square feet out of 125,000 sq. ft. of assignable space in this complex. Nearly all of the offices of Chemical Engineering faculty members and staff, and a conference room, are located in one wing of the second floor of the CAMP Building with a few additional offices located elsewhere in the facility. The chemical engineering laboratory is located in the combined engineering laboratory in the CAMP Building. This facility features a largely open area, approximately 8,700 sq. ft. in size, with experimental stations for chemical, mechanical and civil engineering. Adjacent to the combined engineering laboratory is a well-equipped workshop. Also, some senior design courses are held in the Computer-Aided Design Laboratory, which is a large open-access facility located in the CAMP Building. The Design Laboratory is available for courses other than senior design, and courses such as Chemical Process Calculations and Mass Transfer and Stagewise Operations have made extensive use of this facility. Students have access to this laboratory during evenings and weekends as needed. Chemical Engineering research laboratories, each of which occupies approximately 800 sq. ft., are mostly located across from the faculty offices on the second floor. Some additional research laboratories for polymer processing and crystal growth are in a different wing on the second floor, and a new facility for air-quality research was constructed in the year 2003 in an area that connects the CAMP Building and Rowley Laboratories.

1974



van Brunt



Donohue

Faculty 1976-77

Faculty 1976-77 — Seated left to right are Antoniades, Sukanek, Wilcox, Subramanian, Davis, and Cooney, and standing left to right are Youngquist, Estrin, Ward, Nunge, and Chin

Facu

RESEARCH

“Through the persistent efforts of Herman Shulman,

former chairman of ChE, an active graduate program was developed in the 1950s. Development of the program was viewed as an important and desirable goal, not solely for its own value, but as an important adjunct to a vigorous and well-taught undergraduate program.”

— excerpt from “Expanding Frontiers at Clarkson” by David O. Cooney, *Chemical Engineering Education*, Winter 1971, pages 12-16

Double Pipe Heat Exchanger Experiment
in the Undergraduate Laboratory in
Peyton Hall in 1979



1980

Faculty 1979-80 — Standing in the front row left to right are Chin, Estrin, Baldewicz, Cooney, Ravishankar, Cole, and Harris, and in the back row left to right are Wilcox, McCluskey, Nunge, McLaughlin, Rasmussen, Sukanek, and Youngquist



Faculty 1979-80

Clarkson's Chemical Engineering program started out with the objective of providing instruction to undergraduates. From the beginning, students were encouraged to engage in inquiry about nature, as indicated by the requirement of a senior thesis. But there was no graduate program based on advanced coursework and research, even though Clarkson was authorized to grant graduate degrees beginning in 1913. Scholarly research, which is identified with publication in archival journals, began only with the arrival of Herman Shulman in 1948, who was determined to start a graduate research program, and who had been promised by President Jess Davis during his interview that the college would support it. After a year on campus, Shulman brought up the President's promise with his Chairman, Hecker, who went and talked to the President about it. Shortly thereafter, Shulman was given three teaching assistantships with which to support graduate students. Armed with these, he recruited some bright undergraduates into the Master's program. Shulman was also instrumental in involving undergraduate students in research through a "project" course, a tradition that has flourished in the Department. Soon, Shulman began submitting proposals for research support to federal agencies, thus initiating a strong externally funded research program on a variety of topics and was advising several graduate students who were required to submit a thesis for the M.S. degree. He also single-handedly developed and taught the graduate courses in chemical engineering until the arrival of new faculty members who could help. In the late fifties, Shulman, along with a handful of faculty members who wanted to develop graduate programs at Clarkson, convinced a reluctant administration to permit them to begin a doctoral program. This they achieved by telling the administration that they would require no additional resources!



Faculty 1985-86

Faculty 1985-86 – Standing in the front row left to right are Obot, Weiland, Subramanian, Chin, Baltus, Wayburn, and Harris, and in the back row left to right are Babu, Taylor, Rasmussen, Wilcox, Lucia, McLaughlin and McCluskey

1985

Shulman advised some of the first doctoral students in the Chemical Engineering program. An early member of this group was Robert Cole, who had graduated with a B.S. in Chemical Engineering from Clarkson in 1954. After a few years away, Cole returned to Clarkson to perform his M.S. thesis research on adsorption on ion exchange resins under the direction of Shulman. After that, the story as told by Shulman, is that Cole, who was by now on the faculty, developed his own proposal for his doctoral thesis on boiling heat transfer and sent it to the National Science Foundation for support. The reviews were favorable, but the Foundation did not want to make an award to a person without the doctoral degree. So, Shulman agreed to re-submit the proposal jointly with Cole and also agreed to serve as Cole's doctoral advisor on the project. They received funding from the Foundation, and after completing his Ph.D., Cole went on to study boiling heat transfer, especially bubble dynamics, throughout his career at Clarkson until his retirement in 1995. Along the way, Cole also developed a variety of other research interests, and made contributions in fluid mechanics, heat and mass transport, and materials processing in reduced gravity.

The next additions to the faculty were Ward, who specialized in systems analysis, Estrin, whose interests were in solid-vapor-liquid reactions, condensation, and crystallization phenomena, and Youngquist, who studied reaction, adsorption in porous media, and crystallization problems. Shaw, who came in 1964, worked initially on nuclear engineering, and later on reverse osmosis and other transport phenomena problems. By now, a good fraction of the seven faculty members in the Department were active in research, supporting graduate

1987



Some of the past Department Chairs at a reception held at an AIChE Meeting in 1987 – Gill, Shulman, Wilcox, Subramanian, and Davis

students with external funding, and the first Ph.D. degrees were granted in 1965 as noted earlier. The faculty perceived research not only as a vehicle for providing graduate education, but also as a means of keeping current in their fields, and involving undergraduate students in the process of discovery. The ability to conduct a strong scholarly research program was by now a routine requirement in addition to strong teaching skills when searches were conducted for new faculty members.

The arrival of Gill in 1965 transformed the research profile of the Department in a substantial way, not only because of his reputation as a leader in research on transport phenomena in Taylor dispersion and reverse osmosis among other subjects, but also because the size of the faculty nearly doubled from seven to 13 during his tenure as Chairman. Nunge, who came in 1965 along with Gill, also brought strength in the area of fluid mechanics and heat and mass transport. During the Gill era, the Department developed in research strength in transport phenomena, process control and optimization, thermodynamics, and nucleation and growth phenomena in gases and liquids. The transport phenomena group was particularly strong because more than half of the faculty members in 1971 were conducting research in that area. Subramanian arrived in 1973, adding to the strength in transport phenomena, followed in 1974 by Chin who brought a general expertise in electrochemical phenomena and, in particular, in mass transport in electrochemical systems.

The addition of Wilcox in 1975 served to strengthen the crystallization area because of his leadership position in crystallization research. Subsequently, the Department diversified in its research strengths with the help of a substantial growth in faculty size from 10 to 18 during the Wilcox era. Babu, Campbell, McCluskey, Oyama, Sukanek, Rasmussen, and Suni, along with

CAMP

CAMP Building

The Keck Continuous Distillation Column in the Undergraduate Laboratory in the CAMP Building



Wilcox, contributed to the development of a reputation of the Department in Materials Science and Engineering. Under Wilcox's leadership, Clarkson established a Center for Advanced Materials Processing in 1985-86 with support from New York State. The State also helped in financing the construction of a brand new building on Clarkson's hill campus, known as the CAMP (Center for Advanced Materials Processing) Building. Because approximately half of the faculty were engaged in research related to materials processing, the entire Department moved to this new building in 1991, along with faculty members from other disciplines who were participating in materials research. Wilcox also spawned an interest on the part of several faculty members in research in materials processing in a low gravity environment. He inspired Cole and Subramanian to engage in research in this area, along with himself, earning Clarkson a reputation for research in phenomena of relevance to reduced gravity in the long run. The move of McLaughlin from Physics into Chemical Engineering in 1979, along with the addition of Obot and Baltus in the next few years, served to strengthen the fluid mechanics and heat and mass transport area substantially. Wilcox also hired Taylor, Lucia, Harris, Wayburn, and Weiland all of whom specialized in research on various aspects of mass transfer, process design, simulation, and control. After the departure of Gill, the department continued to maintain its strength in transport phenomena, while diversifying into materials science and engineering and process design, simulation, and control. The most recent additions to the Department, recruited under the leadership of Ross Taylor, are Hopke, who moved from Chemistry into

1996

Faculty 1995-96



Faculty 1995-96 – Standing in the front row left to right are Subramanian, McCluskey, Baltus, and Harris, and in the back row left to right are Chin, Rasmussen, Campbell, Suni, Taylor, Nunge, and Babu

Chemical Engineering with a strong international reputation in air quality and air pollution research from a basic perspective, and Rengaswamy, who adds significantly to the Department's expertise in process design, simulation, and control. Spurred by the exciting developments in biology and biotechnology, some of the current faculty members are already entering into research in this area. This ability to identify and move into frontier areas of research has always been a key characteristic of the Clarkson chemical engineering faculty.

Clarkson graduate students have won distinction in many ways, and it is not possible to list all of their accomplishments in this brief document. A notable national recognition for graduate students is the Ted Peterson Award given annually by the Computing and Systems Technology Division of the American Institute of Chemical Engineers. This award, initiated in 1983, recognizes an individual for published work on the application of computing and systems technology to chemical engineering and is specifically for work done by the individual while pursuing graduate or undergraduate studies in chemical engineering. S. Venkataraman, who worked with Angelo Lucia on his doctoral thesis, won it in 1988, followed by R. Krishnamurthy in 1990; Krishnamurthy worked with Ross Taylor on his doctoral thesis. It is noteworthy that Wayburn, who was a Clarkson faculty member, also won this award in 1987.

This brief history of the chemical engineering program at Clarkson has highlighted the important milestones in its development during the first hundred years. The program is proud of its service to the profession, and looks forward to the future with great optimism.

Equipment



Injection Molding Machine in the Undergraduate Laboratory in the CAMP Building



THE LIST OF CHEMICAL ENGINEERING FACULTY MEMBERS

Name	Period of Service in Chemical Engineering	Notes
Frank M. Williams	1898 - 1908	
Lucius K. Russell	1908 - 1931	
George S. Lobdell	1916 - 1929	
Francis H. Reynolds	1925 - 1965	
Charles H. Hecker	1929 - 1958	
Henry S. Winnicki	1938 - 1942	
Frederick P. Ciambrone	1941 - 1943	Departure year is estimated; no <i>Bulletin</i> available for 1943
Duane L. Green	1946 - 1958	left approximately in 1948 and rejoined in 1953; no <i>Bulletin</i> available for 1946 and 1947 years
Morse Hill	1947 - 1948	
Herman L. Shulman	1948 - 1988	Chairman, 1958 - 1964
William C. Frishe	1949 - 1950	
Per Bro	1951 - 1952	
Robert Cole	1957 - 1995	
Thomas J. Ward	1958 - 2000	
Joseph Estrin	1960 - 1980	Chairman, 1964 - 1965, 1971 - 1973
Gordon R. Youngquist	1962 - 1985	
Robert A. Shaw	1964 - 1975	
William N. Gill	1965 - 1971	Chairman, 1965 - 1971
Richard J. Nunge	1965 - 2000	Chairman, 1974 - 1975
Jose A. Blanco	1966 - 1967	
Chien-Shih Lu	1967 - 1972	
E. James Davis	1968 - 1978	Chairman, 1973 - 1974
Andrew F. Burke	1969 - 1972	
David O. Cooney	1969 - 1981	
John H. Beamer	1970 - 1972	
Joseph L. Katz	1970 - 1979	
Edward W. Graham	1971 - 1974	
Sudarshan K. Suneja	1972 - 1973	
R. Shankar Subramanian	1973 -	Chair, 1986 - 1996

Faculty 2003-2004



Seated left to right are Suni, Hopke, Rengaswamy, and Harris, and standing left to right are Rasmussen, Subramanian, Taylor, McLaughlin, Babu, and McCluskey

2004

Name	Period of Service in Chemical Engineering	Notes
Vincent Van Brunt	1974 - 1975	
Der-Tau Chin	1975 -	
William R. Wilcox	1975 -	Chairman, 1975 - 1986
Michael G. Antoniadis	1976 - 1977	
Peter C. Sukanek	1976 - 1990	
Richard J. McCluskey	1977 -	
Marc D. Donohue	1977 - 1979	
Sandra L. Harris	1978 -	
Don H. Rasmussen	1978 -	
William L. Baldewicz	1978 - 1981	
John B. McLaughlin	1979 -	joined Clarkson Faculty in 1974
Ross Taylor	1980 -	Chair, 1999 -
Ralph H. Weiland	1980 - 1989	
Nsima T. Obot	1980 - 2000	
Suryadevara V. Babu	1981 -	
Angelo Lucia	1981 - 1995	
Ruth E. Baltus	1983 -	
Thomas L. Wayburn	1983 - 1987	
Gregory A. Campbell	1984 -	Chair, 1996 - 1998
S. Ted Oyama	1988 - 1993	
Ian I. Suni	1993 -	
Phillip K. Hopke	2000 -	joined Clarkson Faculty in 1989
Raghunathan Rengaswamy	2002 -	

1. Information on period of service obtained from Chemical Engineering annual reports beginning with the 1969-1970 academic year; for earlier years, inferred from *The Clarkson Bulletin*, which became the *Clarkson Catalog* in later years; these latter estimates are approximate.
2. Until 1929, chemical engineering courses were taught by individuals with faculty rank in Chemistry; the first appointment in Chemical Engineering was that of Charles Hecker, listed as Professor of Chemical Engineering in the April 1930 *Clarkson Bulletin*.
3. In the case of two faculty members who initially joined other Departments at Clarkson, and later moved into the Department of Chemical Engineering, this information is noted explicitly.



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