



## **The Chemistry Department 1946-2000**

Written by: Edward M. Eyring

Assisted by: April K. Heiselt & Kelly Erickson

## Henry Eyring and the Birth of a Graduate Program

In January 1946, Dr. A. Ray Olpin, a physicist, took command of the University of Utah. He recruited a number of senior people to his administration who also became faculty members in various academic departments. Two of these administrators were chemists: Henry Eyring, a professor at Princeton University, and Carl J. Christensen, a research scientist at Bell Laboratories.

In the year 2000, the Chemistry Department attempts to hire a distinguished senior faculty member by inviting him or her to teach a short course for several weeks as a visiting professor. The distinguished visitor gets the opportunity to become acquainted with the department and some of the aspects of Utah (skiing, national parks, geodes, etc.) and the faculty discover whether the visitor is someone they can live with. The hiring of Henry Eyring did not fit this mold because he was sought first and foremost to beef up the graduate program for the entire University rather than just to be a faculty member in the Chemistry Department. Had the Chemistry Department refused to accept Henry Eyring as a full professor, he probably would have been accepted by the Metallurgy Department, where he had a courtesy faculty appointment for many years.

Sometime in early 1946, President Olpin visited Princeton, NJ, and offered Henry a position as the Dean of the Graduate School at the University of Utah. Henry was in his scientific heyday having published two influential textbooks (Samuel Glasstone, Keith J. Laidler and Henry Eyring, The Theory of Rate Processes, McGraw-Hill Book Co., New York, 1941; Henry Eyring, John Walter and George E. Kimball, Quantum Chemistry, John Wiley & Sons, New York, 1944) and having recently been elected to the National Academy of Sciences. Henry respectfully declined the job offer. The next day his wife, Mildred Bennion Eyring, told him that she and her three sons were moving back to her home in Utah with or without him. Henry quickly decided to accept the \$8,000 per year job at The University of Utah, and he and his family arrived for work in Salt Lake City late in the summer of 1946.

At the time of Henry's arrival The University of Utah already had a strong undergraduate program in chemistry. Thus, Henry Eyring's principal impact within the department over the next few years was on the graduate research program, which was less mature. James M. Sugihara successfully defended the first Ph.D. degree dissertation in Chemistry at the University of Utah in August 1946. Dr. Sugihara and Dr. Marilyn Alder



A hallway in the old Physics/Chemistry Bldg. (ca. 1950) that has since become the John Widtsoe Mathematics Bldg.

Marquis, mentioned later in this narrative, were honored in fall of 1997 at a 50<sup>th</sup> anniversary event for University alumni. Dr. Sugihara's Ph.D. was one of the first two Ph.D.'s granted at the University; the other recipient that year was Ewart Swinyard who later became the Dean of Pharmacy. As of the year 2000, the University of Utah has granted over 675 Ph.D.'s in Chemistry. At the end of this narrative, the reader will find the names of the students who earned these Ph.D.'s, along with the year they earned their degrees. Back in 1947, Sugihara's 84-page dissertation on "The Reactions of Mercaptans with Sucrose and Molasses" included only three approval signatures: Walter D. Bonner, Lloyd E.

Malm and Elton L. Quinn. All three were faculty members in the Chemistry Department. Yet, in this dissertation there is not a signature from the Dean of the Graduate School because there was not a Dean by that date.

In his first ten years at The University of Utah (1946-1956) Henry provided a lot of stimulation to the graduate research program in the Chemistry Department. His own lively research program made the department more attractive to like-minded Ph.D. chemists such as Bruno Zwolinski, Ransom Parlin, Rufus Lumry, Bill Cagle and Austin Wahrhaftig, all of whom joined the faculty and engaged in active research programs. In those first ten years Henry also attracted many gifted graduate students to his research group such as Tracy Hall, Cal Giddings, George Blyholder and Art Ruoff who went on to successful post-Ph.D. careers in academe.

Federal funding of university research increased substantially during this ten-year period that immediately followed World War II. Austin Wahrhaftig, for example, built a strong experimental mass spectroscopy research program at The University of Utah with funding from the Atomic Energy Commission, which later became the Department of Energy. One of the high-impact, scientific publications that came out of the Chemistry Department at this time, was co-authored by H. Rosenstock, M. Wallenstein, A. Wahrhaftig and H. Eyring [Proceedings of the National Academy of Science U.S. 38, 667 (1952)]. This paper reported a statistical theory of the break-up of large molecules after ionization and excitation by electron impact. Henry Rosenstock and Merrill Wallenstein, two Wahrhaftig graduate students, went on to influential careers at the National Bureau of Standards.

To accommodate the growing number of people in the department and concomitant expanding research activity in Chemistry, several World War II wooden army buildings were relocated east of the combined Physics/Chemistry Building. Some of the "temporary" buildings of that era still exist in various locations around the campus, most notably the "Annex" located due east of the Huntsman Center. However, a two story wooden barracks building that was relocated north and east of the Park Building disappeared many years ago. It bore the rather pretentious name of "The Institute for the Theory of Rate Processes" and housed many of Henry's research students in torrid summer heat and chilling winter cold until his research program was accommodated in an old brick building ("Applied Research" due north of the Park Building). This building was razed in the 1990's to accommodate construction of the beautiful INSCC Building, which houses students from the Departments of Physics, Chemistry and Engineering who do computationally intensive research.

A particularly vivid memory for many of the graduate students in the department of Chemistry in the 1950's is that of Professor Henry Eyring's quantum mechanics course taught from his textbook (Eyring, Walter and Kimball). The class was held every Monday, Wednesday and Friday at about 9:30 a.m. in the office of the Dean of the Graduate School at the north end of the Park Building (where President Machen is now housed). The book has a green cover, is very mathematical, and is difficult to read, so it was frequently called the "green diamond." At the same hour on Tuesday, Thursday and Saturday mornings, most of the same students came back for a dose of statistical mechanics from an orange colored paperback irreverently called the "yellow peril" that had been put together from Marilyn

Alder's in-class notes. In the summer these arcane topics gave place to the theory of rate processes taught by "the Dean" from his textbook co-authored by Glasstone, Laidler and Eyring. One summer in the late 1950's Henry held class on Independence Day, July 4<sup>th</sup>, and on Pioneer Day, July 24<sup>th</sup>. This insistence on putting schoolwork ahead of public holidays seems a little extreme in hindsight, but he brought an infectious enthusiasm for science to these classes that had a very broad impact on the climate for scientific research on the "U" campus. Many students enrolled in his classes from departments other than Chemistry, which greatly enlarged his impact on the developing research programs across the entire University of Utah campus.

It is worth considering why the personality of Henry Eyring had such a great impact on the Chemistry Department throughout the 35 years (1946-1981) he was on the faculty. Robert Miller, in 1984-86, interviewed a number of Henry Eyring's contemporaries as part of the E.L. Cooley Oral History Project (of the Marriott Library). Here are just four excerpts from that collection.

Kenneth Pitzer, former university president (Stanford and Rice) and distinguished faculty member at UC Berkeley, speaking to Miller in 1984 stated: "[Henry] was friendly, enthusiastic and extremely self-confident...he was a good salesman of science."

Melvin Calvin, long time faculty member at UC Berkeley and Nobel Prize winner said: "[Henry] was a very skillful lecturer. Very informal. He was very, very, good, but very precise. It was always great to listen to him, always."

Glenn Seaborg, UC Berkeley faculty member, former American Chemical Society president and Nobel Prize winner stated: "He (Henry) was a very clear lecturer. He made things sound understandable, perhaps deceptively so. You had the impression after he explained something that you understood it. [He was] very alert. Articulate. Almost exuding intelligence. A good conversationalist. I would say pleasant. But persistent. He was in good health. Full of energy."

The above three statements illustrate that Henry Eyring was a man who was equally balanced not only in matters of chemistry but also in life. Henry had a warm heart and a wonderful personality. He also had a knack for helping others feel at ease when situations were tense. An example of this comes from one of his students.

John Morrey, one of Henry's Ph.D. students and subsequently a member of the technical staff at the Pacific Northwest Laboratory of the Department of Energy, stated: "I remember an experience I had when I came into his lecture room, next to his office in the Park Building, for my Ph.D. oral exam. I came in a little early, and he was the only member



Henry Eyring, jumping on top of a desk from a standing position circa 1960.

of the committee there. He sensed I'm sure, that I was pretty nervous. And so he said to me, 'John, have you ever seen me jump on the table from a standing position?' There was a big oak table in his room. I said, no. He jumped, but he didn't make it. He sprawled out over the table, catching his shins on the edge. It must have nearly killed him. I'm sure it hurt terribly. He winced, backed off, and he said, 'I didn't make it.' He jumped again. And that time he did. I guess that illustrates more his tenacity and his competitiveness, in a sense with himself, rather than his humor, but he had a great sense of humor. His lectures would be filled with humor. Most of the time the humor was on him, and I think that was one of his magical qualities that made people accept him. There were

times when he'd become a little frustrated at someone and turn it on someone else, but not very often."

Tenacity was certainly one of Henry Eyring's most notable personality traits. The following illustration is from an unpublished autobiographical sketch written on August 8, 1976 when Henry was 75 years old: "A story that mother used to tell about me before I could remember is of father coming home from the cattle ranch [in northern Mexico] with his horse covered with sweat, unsaddling him, putting me on the horse's back and she and father walking down to the river just behind the horse to water the horse. When the horse got out into the river, he shook himself as sweaty horses do and the two-year old tumbled off into the river. According to reports, my first remark after being fished out of the river was 'Put me

back on the horse,' which was done. I have no memory of learning to ride. As far as I know, I always knew how."

During the 1950's Henry Eyring initiated foot races against his research students. However, the first foot race was against several women working in the Park Building including his secretary, Belva Barlow (later Ashton). Henry won that first race decisively. Soon afterward G. Homer Durham and Sterling McMurrin, two of the leading officers of the University Administration, who were somewhat younger than Henry, challenged him to a foot race. In a well-publicized race on the asphalt outside the old Bookstore the two challengers both fell down and failed to finish the race, to the considerable amusement of the community. This ended Henry's string of victories at just two races. For many years thereafter Henry ran against his research students each summer, awarding at least four cash prizes yearly to the fleetest footed. Henry never won any of his own prize money, but it was impressive to see how hard he ran in what amounted usually to a fifty yard dash. There are many people in the community who would not be able to tell you the first thing about Henry Eyring's chemistry but who could tell you about one of those foot races, particularly one that was shown briefly on national television.

Elton L. Quinn was head of the University Chemistry Department from 1947-49. In the 1948-49 University catalog the following department faculty members are listed:

Professors Elton Quinn, Lloyd Malm, and Henry Eyring, Associate Professors Vic Beard, Randall Hamm, Bill Burke, Jim Horton, Assistant Professors Stuart Haynes, Jim Sugihara, George Hill, Austin Wahrhaftig, Ransom Parlin and Bruno Zwolinski

Lloyd Malm was a superlative teacher of inorganic chemistry. A national effort to improve freshman chemistry came along in the 1950's called the Chem Study program. It was headed by George Pimentel of UC Berkeley and enlisted some of the top professors across the country to develop instructional materials. Lloyd was deputized to write a freshman laboratory manual for the Chem Study program that yielded substantial royalties in support of undergraduate scholarships in the University of Utah Chemistry Department. Vic Beard would later run the Associated Rocky Mountain Universities consortium for the Department of Energy in the early 1960's. Randall Hamm left the University of Utah for Washington State University, where he continued his productive research studies of inorganic complexes in solution. Jim Sugihara became a dean at the University of North

Dakota in the early 1960's. George Hill created the Department of Fuels Engineering (recently merged with Chemical Engineering) and was elected to the National Academy of Engineering for his pioneering research in coal chemistry. Ransom Parlin, a gifted physical chemist, left Utah in the 1950's and died prematurely. Bruno Zwolinski also left Utah in the 1950's to become the influential director of an international bank of thermochemical data housed at Texas A&M University. Rufus Lumry (not listed above) also was a faculty member in the 1950's before moving to the University of Minnesota where he taught and researched in biophysical chemistry with distinction.

Many of the above chemists continued to serve on the Chemistry faculty under Elton Quinn's successor. William (Bill) J. Burke, an organic polymer chemist served as department head from 1949 until 1962. According to the 1956-57 University catalog the faculty in Chemistry consisted of the following people:



Bill Cagle (c.a. 1955), an avid collector of rare books, including first editions of LDS literature, who referred to himself as a "backsliding Methodist."

Professors Bill Burke, Lloyd Malm, Henry Eyring, Carl J. Christensen, Randall Hamm, Jim Horton, and Jim Sugihara, Research Professor Alexis Ree, Associate Professors Austin Wahrhaftig, Ransom Parlin, Bill Cagle, and Richard P. Smith

Assistant Professor Burl E. Bryant, Assistant Research Professor Betsy J. Stover, and Technical Assistant Curator Lynn Austin

Before teaching for several years in Chemistry at the end of his career, Carl Christensen was the dean of the College of Mines and Mineral Industries and later what we would now call the Vice President for Research. Carl was a crystal grower from his days at Bell Labs and founded a local company that grew sonar crystals for French submarines. Alexis Ree was a theoretical chemist who was highly regarded in his home country of South Korea. Alexis funneled many talented Korean graduate students into the Chemistry Department to work with either himself or with Henry Eyring.

Bill Cagle was probably the most unique "character" to ever teach in the Chemistry Department. Bill earned a Ph.D. from the University of Illinois in 1946. He was every bit as smart as a doctoral degree awarded at age twenty-two would suggest. He was subsequently a postdoctoral research student at the Institute for Advanced Study in Princeton, N.J. At the University of Utah, he developed the quintessential "look" of the eccentric professor. Students would sometimes see him walking across the campus talking to himself with his head slightly bowed and rubbing his hands together in evident satisfaction. Those students who became acquainted with him as a lecturer found Bill to be approachable, pleasant and extraordinarily well organized in his lecturing style that he salted with amusing asides. His faculty colleagues heard many of Bill's anecdotes so often that they could recite them by heart. Bill was the ultimate repository of useful chemistry knowledge, now superseded by the Web-of-Science database. He and his students published some beautiful x-ray crystallographic studies of small molecules. Bill was also an avid collector of rare books, including first editions of early LDS literature. He characterized himself as a "backsliding Methodist" but could give you better answers about Mormon history than just about any "Saint". Bill never married, and his heirs sold his wonderful collection of books when he died without a will at age 63 in 1986.

Richard P. Smith is a native Utahn. In 1946, while he was in the military in Japan, Richard learned about Henry Eyring coming to the University of Utah and decided that he would like to work in the area of physical chemistry. He got his Ph.D. with Henry Eyring and then spent three years at Cambridge, MA, as a prestigious Harvard Fellow. After fewer than ten years on the University of Utah Chemistry faculty Richard went to work for Exxon in New Jersey, where he now resides in retirement.

Betsy Jones Stover was also a Utah native. After getting her Ph.D. in physical chemistry Betsy became the director of a big Atomic Energy Commission project in the University of Utah Medical School that studied disease and mortality of a very large colony of beagle dogs that had been systematically poisoned with plutonium. She wrote many scientific papers, some of which were co-authored with Henry Eyring. Her appointment in Chemistry as a research professor was a recognition of this longstanding collaboration with Henry. She may have been the first woman listed in the University catalog as serving on the Chemistry Department faculty although her primary University appointment was always in

the Medical School. She moved many years ago to North Carolina, where she has since passed away.

Lynn Austin retired after teaching chemistry in a California junior college for many years. At the time of his service on the University of Utah faculty he was charged with the management, among other responsibilities, of the undergraduate laboratories. Lynn had bright red hair in those days and a thoroughly engaging personality.

As head of the department, Bill Burke was asked in 1956 to compose a ten-year department history for President A. Ray Olpin. Following is that report (dated August 17, 1956):

#### Graduate Programs

The first Ph.D. from the University of Utah was awarded in 1947 in the field of chemistry. Since that time the graduate program in the Department of Chemistry has grown rapidly from a very few students to an average of 45 to 50 over the past several years. Of the 208 Ph.D.'s awarded to date by the University of Utah, 54 have been in chemistry. On the basis of a recent visitation by two eminent chemists, Dr. Ralph Shriner of the University of Iowa and Dr. John Willard of the University of Wisconsin, the Committee on Professional Training of the American Chemical Society commended the department on the "excellent program of training in chemistry at the doctoral level."

A wide variety of important problems in representative areas in the field of chemistry are under current investigation. These include studies in: reaction rate theory, mass spectra and molecular structure, polarography, explosion phenomena, catalysis, plastic flow, structure and quantum mechanics of activated complexes, sintering of alumina, kinetics of the oxidation of carbon, transport processes at electrodes, combustion, surface chemistry, chelate complexes, boron alkyls, photosynthesis, Gilsonite, polycarbocyclic ring systems related to colchicine, mechanisms of organic reactions, carbohydrates, chemotherapy, phenol-formaldehyde, and heterocyclic compounds.

The rapid growth of the research program in chemistry has created serious problems with regard to laboratory space and supplies and equipment. However, national recognition of the quality of the staff has resulted in considerable support for our research activities from private industry, non-profit corporations and various branches of the federal government. Supporting agencies include the National Science Foundation, Atomic Energy Commission, Office of Ordnance Research, Office of Naval Research, Air Material Command, California Research Corporation, American Gilsonite Company, Purex Corporation, Research

Corporation of America, and the National Foundation for Infantile Paralysis. Our high level of research activity has been possible only through such assistance and the attitude of the University administration toward creative work.

The excellence of the graduate program in chemistry has resulted in the attraction of highly qualified graduate students as teaching assistants in spite of our comparatively low stipend. These assistants have greatly contributed to our capacity for handling large numbers of students with a relatively small senior staff. This program has increasing significance in view of the difficulty colleges and universities are now experiencing in obtaining qualified teaching personnel.

At present most of the research in chemistry is housed in three separate temporary buildings. It is hoped that adequate permanent facilities can be provided in the near future for research in this important area.

#### Undergraduate Program

While the number of students graduating with bachelor degrees in chemistry has not been large, an unusually high percentage of these have gone on and completed their work for Ph.D. degrees. Many have been awarded substantial fellowships in national competition. This of course is related to the solid program of courses offered by the department and to the individual attention and encouragement given to our students. Several members of the staff have been active in the development of a superior general education course in chemistry.

In addition to majors, pre-medical, pre-dental and other students in the University college, large numbers of students from other colleges, such as Engineering, Pharmacy, Nursing and Mines and Mineral Industries also take basic work in our department. As a result of the continued increase in enrollment, it was necessary over the past few years to provide new facilities for laboratory instruction in physical and organic chemistry. At present one of our two general chemistry laboratories is being remodeled so that it will accommodate about 50% more students. While most of the antiquated laboratories in the department have been remodeled during the past six years, there is at present a desperate need for an adequate laboratory for quantitative analysis.

#### Other Activities

The Department of Chemistry sponsors a biweekly seminar in which the speakers are drawn about equally from our staff and from other departments throughout the University. We are hopeful that such a plan will stimulate others to become interested in our seminars. At the same time this enables our staff and graduate students to get a first hand picture of research interests and activities in other areas of the University. In addition, the Department

sponsors two other biweekly seminars. One of these is concerned with organic chemistry and the other with physical, analytical and inorganic chemistry. These seminars are in general more highly specialized and are designed to give our graduate students an opportunity to present and discuss various topics of current interest in Chemistry. The Department has also worked closely with the American Chemical Society, Sigma Xi and the Division of Biology in sponsoring prominent speakers.

Members of the staff have actively participated in the American Chemical Society and other national scientific organizations. Over the past ten years there has been a major increase in the number of scientific publications from the department. Dean Henry Eyring has been the recipient of numerous medals and awards for his outstanding contributions to science. Among these were the Nichols medal, the Bingham medal, and the Research Corporation Award. He was also invited to give the Edgar Fahs Smith Lecture at the University of Pennsylvania, the G.N. Lewis Lecture at the University of California and the William Pierson Field lectures at Princeton.

Bill Burke was a forceful department head with an engaging smile and an affinity for bow ties. He ran a very active research program in polymer chemistry in one of the one-story wooden shacks east of the Physics/Chemistry building and had a number of graduate students, including Richard (Dick) Quisenberry, Harold Higginbottom and Gary Goken who went on to very successful careers in industry. The department secretary during the latter part of Bill's long leadership was Irene W. Paul.

Graduate students in the department of Chemistry at the University of Utah during the 1950's took a written preliminary exam ("prelim") over a two-day period to qualify for Ph.D. candidacy. Those intending to write a dissertation in physical chemistry took a grueling "general prelim" the first day that covered graduate course work in analytical, inorganic and organic chemistry. The "special prelim" the next day tested the student's knowledge of physical chemistry in some depth. Corresponding "special prelims" were administered to students majoring in each of the other three areas of chemistry. The result of this brutal coursework and testing program was that a star organic chemistry graduate student such as Bryant Rossiter went off to his first job at Kodak with more knowledge of quantum mechanics and statistical mechanics than would be true of the University of Utah's year 2000 Ph.D. graduates in organic chemistry. Bryant's extraordinarily successful thirty-year career

as a research leader at Kodak was obviously the result of his bright mind and pleasant personality. However, the University of Utah Chemistry faculty of the 1950's was bound and determined that every graduating Ph.D. would have the broadest knowledge of chemistry possible.

The demand for well-qualified Assistant Professors of chemistry was so great nationwide in the latter 1950's and early 1960's that it made sense to hire some University of Utah graduates. Bill Burke led the faculty in appointing Richard P. Smith (University of Utah Ph.D., Harvard post-doc), J. Calvin Giddings (University of Utah Ph.D., Wisconsin post-doc), David M. Grant (University of Utah Ph.D., Illinois post-doc), and Edward M. Eyring (University of Utah Ph.D., Goettingen post-doc) between 1955 and 1961. The only Assistant Professor appointed during that period that had not earned a doctorate at the University of Utah was William W. Epstein (UC Berkeley Ph.D., Illinois post-doc).

## The Big Move and Dave Grant's Recruiting Frenzy

David M. Grant succeeded Bill Burke as department head in 1962. Having someone who is not yet a full professor chair a department is not very common for political reasons. Dave Grant has always demonstrated the attributes of a successful leader, and his appointment to the role of Head was clearly one of the best ever-made in the Chemistry Department.

The 1963-64 University catalog lists the following faculty members in Chemistry:



Jerry Driscoll and Ron Ragsdale presenting their annual "Faraday Christmas Lecture", complete with old English tophats.

Associate Professor and Head: David M. Grant, Professors Bill Cagle, Carl Christensen, Henry Eyring, Jim Horton, Lloyd Malm, Jim Sugihara, and Austin Wahrhaftig, Research Professors Cal Giddings and Alexis Ree, Associate Research Professor Betsy Stover, Assistant Professors Bill Epstein, Ted Eyring, Evan L. Allred, George W. Latimer, Ronald O. Ragsdale, Wesley G. Bentrude, Dennis J. Caldwell and Roger Kust.

Bill Epstein, retired in 1998, and now residing in San Luis Obispo, CA, is a natural products organic chemist. His "road map" problems in Honors Organic Chemistry challenged talented undergraduates for generations. Bill also knew how to combine the hunt for interesting new plants for his natural products studies with pleasant fly fishing trips to the Pacific Northwest. Ted Eyring continues his research on topics as diverse as the kinetics of oxidation of phenol by aqueous iron(VI), the synthesis of oxygenated fuel additives for automobile engines, and the enzymatic activity of proteins encapsulated in porous glass monoliths. Ted has somehow always managed to be slightly out of step with his colleagues. With the help of Dr. Laya

Kesner he continues to promote service-learning pedagogy favored more by social scientists, and he is often the only person in the building wearing a necktie. George Latimer was a Salt Lake native who earned his Ph.D. in analytical chemistry at Princeton. He came to the University of Utah faculty from PPG in Corpus Christi and went back there after a couple of years for personal reasons. Dennis Caldwell was a theoretical chemist who left the University to work in industry (Hercules) and then came back to the University of Utah campus as a faculty member in Chemical Engineering. Dennis and Karin Caldwell (Research professor, later chair of Bioengineering at the University of Utah) now reside in Uppsala, Sweden. Roger Kust was an electrochemist who left the department for industrial employment in New England.

In the year 2000, Professors Ragsdale and Bentrude remain on the faculty. Ron's impact on freshman chemistry is legendary. He has probably taught more high school and first year undergraduate students than anyone else who has ever served on the Chemistry faculty. The lecture demonstrations developed with Dr. Jerry Driscoll for Ron's lectures have been incorporated into "Faraday Christmas Lectures" that have become the one aspect of the Chemistry Department best known to the citizens of Utah. Michael Faraday was one of the most distinguished chemists of the 19<sup>th</sup> century. As director of the Royal Institution in London he initiated public lectures at Christmas time that included exciting chemical demonstrations, hence the above, rather formal, name for what is familiarly called the "Ron [Ragsdale] and Jerry [Driscoll] Show." Ron's international travel in support of the International Baccalaureate program in chemistry possibly surpassed in mileage and exotic destinations the feats of the most energetic travelers on the Chemistry faculty.

Wes Bentrude has also taught large numbers of students enrolled in the sophomore organic chemistry courses as well as in graduate organic chemistry courses. In his 37 years of service at the University of Utah to date, Wes has had a well-funded research program in phosphorus organic chemistry. Although Wes now spends half of each academic year fishing in Florida, he and his students are continuing to publish research consistent in quality and quantity with the high standards that Wes has always set for himself.

In 1963 the Utah legislature authorized planning for a new chemistry building. Wilford Burton and Royden Derrick were Regents who played a decisive role in getting the building funded. Austin Wahrhaftig was deputized to provide counsel to the architect, Henry

Fetzer, over the next five years. Austin's attention to detail and foresight had a very beneficial impact on the final design of what is now called the "North Wing of HEB". Also in 1963, Henry Eyring had the honor of serving as the elected president of the American Chemical Society.

Roland Robins joined the faculty in 1964. He had a country boy style of talking and a high energy level for research in nucleoside chemistry. His big research group gave the faculty a glimpse of what major federal funding could do in building up organic chemistry research in the department. Roland left the department a few years later to work in a pharmaceutical firm in California and has since passed away.

Dave Grant succeeded in recruiting Pete D. Gardner to the faculty in 1965. Pete was a tenured full professor of organic chemistry at the University of Texas at Austin. In addition to his expertise in research, Pete brought unusual leadership skills to the Utah campus and served with distinction as Dean of Science, Academic Vice President to President David P. Gardner (no relation), and Chair of Biology, successively. Pete died prematurely at age 62 on February 4, 1989.

In 1965, the University instituted the Distinguished Teaching Award. This is an award made at Commencement in honor of three to five faculty members throughout the University to recognize exceptional teaching performance. Lloyd E. Malm was one of the first three recipients of this prestigious award in 1965. The names of the six faculty members from the Chemistry Department who have won this award appear in the awards list at the end of this volume.

The President of the University in 1992 established another University wide teaching award called the Presidential Teaching Scholar Award. This award is made to ten faculty members each year and their salaries are increased by \$5,000 per year with continuing adjustments for inflation until



Dave Grant (right) and Ted Eyring (left) exhibit their teaching skills in the new Chemistry building (late 1960's).

they retire. Four recipients from the Chemistry Department are listed at the end of this volume.

Starting in 1999, the three Distinguished Teaching Awards and the ten Presidential Teaching Scholar Awards were rolled into just six Distinguished Teaching Awards made each year.

The University Distinguished Research Award also had its beginning in 1965 with a single award being made that year to Leroy J. Robertson, a composer on the Music faculty. The next year there were two Distinguished Research Awardees: Henry Eyring in Chemistry and Jacob Geerlings in Languages. Since 1970, three Distinguished Research Awards have been made each year at Commencement. Members of the Chemistry Department faculty have been honored with the Research Award more frequently than any other department on campus by a wide margin. The thirteen Chemistry faculty recipients of this award are listed (by year) in the Awards section at the end of this volume.

In 1966, Jean Futrell joined the faculty in the rank of Associate Professor and brought with him a well-funded research program in mass spectrometry that became well known for advances in chemi-ionization. About sixteen years later Jean moved to Delaware, where he chaired the University of Delaware Chemistry Department with distinction. Jean is now the Director of the William R. Wiley Environmental Molecular Sciences Laboratory at the Pacific Northwest National Laboratory in Richland, WA. While Jean was at the University of Utah he was exceptionally successful in teaching his graduate students how to do important research in mass spectrometry. A notable illustration of



Cheves Walling was already a member of the National Academy of Sciences when he came to the University.

Jean's success as a teacher and researcher are the recent achievements of two of his former University of Utah Ph.D. students. Dr. Richard D. Smith and Dr. Marvin L. Vestal have both recently made important contributions to the development of new approaches to study proteomes. A proteome is the entire complement of proteins that can be expressed by a particular cell, organism or tissue; proteomics is the study of the protein complement

expressed at a given time or under a specific set of environmental conditions. While the availability of complete genome sequences, as now being provided by the Genome Program, opens the door to important biological advances, much of the real understanding of cellular systems and the roles of its constituents will necessarily be based upon proteomics. The capability to precisely measure changes in the relative expression of numerous proteins simultaneously enables identifying and understanding the function of the proteins participating in the multiple pathways, as well as insights into how cellular networks are linked.

Smith and Vestal have been separately developing tools based upon mass spectrometry for making more effective proteome measurements. Dr. Vestal (Applied Biosystems) has developed a new tandem time of flight mass spectrometer that allows orders of magnitude higher throughput for protein identification, presently a major bottleneck in proteomics. Dr. Smith (Pacific Northwest National Laboratory) has developed and applied a new approach that uses a new ultra-sensitive Fourier transform mass spectrometry developed in his laboratory, along with stable-isotope labeling, and the new concept of "accurate mass tags" to make much more comprehensive, sensitive, faster and quantitative proteomics measurements than previously possible. The global perspective that results from proteomics measurements provides a comprehensive view of the detailed changes in cellular pathways and networks, thereby improving the understanding of how biological systems respond to environmental perturbations. The practice of proteomics is expected to have profound impacts in areas that range from drug development to biotechnology.

The department moved into the first phase "north wing" of the present Chemistry Building in January 1968. Some months later Sir George Porter, the Director at that time of the Royal Institution in London and a 1967 recipient of the Nobel Prize, gave the principal invited talk at the dedication of the new building.

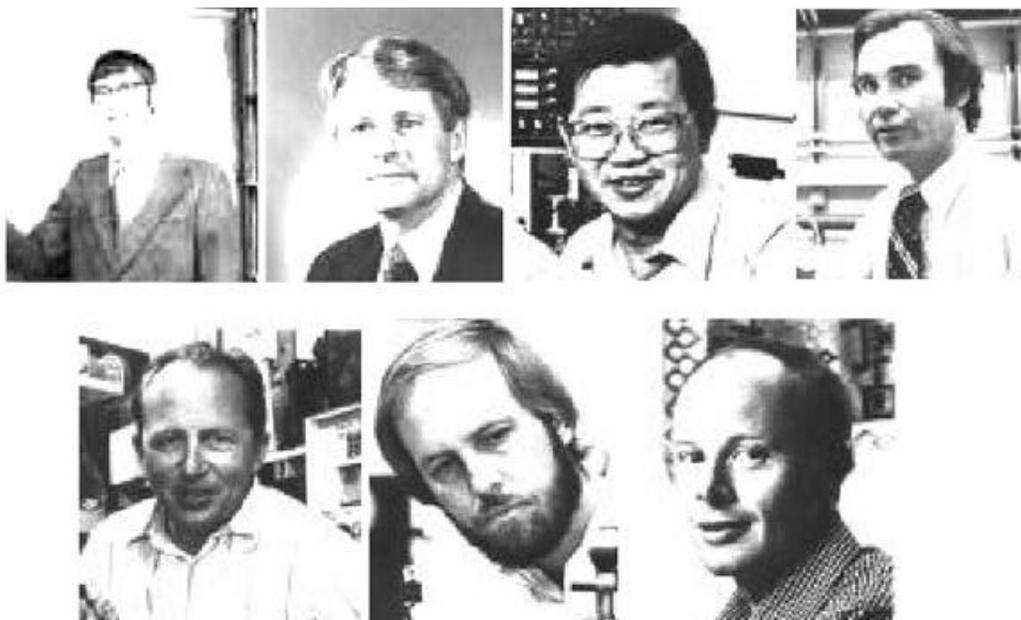
The availability of more space for research in this new building was one of two factors that took the department to a new level of national visibility, permitting Dave Grant to attract outstanding new faculty members. The other factor was a three-million-dollar Center of Excellence Award from the National Science Foundation, wisely used to develop a teaching intern program for postdoctoral students and to expand major research instrumentation used by more than one faculty member, rather than simply to enlarge the size

of the faculty. Steve Hadley was appointed to the rank of Assistant Professor at about this time (1968).

Robert W. Parry, an internationally known inorganic chemist, came to the University of Utah from Michigan in 1969. He had actually spent the previous year at the University of Utah looking the department over while on leave from Michigan. In the same year (1969), Cheves Walling came to Utah from Columbia. Cheves was already a member of the prestigious National Academy of Sciences and was known worldwide for his research in free radical organic chemistry. While at the University of Utah, Bob would become the President of the American Chemical Society and Cheves would serve for a number of years as the Editor of the Journal of the American Chemical Society, arguably the most influential chemical periodical in the world. Parry and Walling were both appointed to the rank of Distinguished Professor, a title already held at that time by Henry Eyring. Overnight the University of Utah became a more prestigious Chemistry Department where the ablest young chemists could reasonably aspire to build their research careers to international prominence.

Thus, Dave Grant was in a position to recruit a string of outstanding junior faculty members [Peter Stang (1969), Dale Poulter (1969), Chin-Hsien (Jim) Wang (1969), Len Spicer (1969), Josef Michl (1971), Bill Breckenridge (1971), and Jack Simons (1972)] who contributed strongly to the growing research reputation of the department, even as their original research interests changed. Peter Stang, trained as a physical organic chemist, has become a distinguished organometallic chemist. Dale Poulter, also trained as a physical organic chemist, is a widely known biochemist. Jim Wang shifted immediately from NMR spectroscopy to a very productive career in laser spectroscopy of polymer solutions. Len Spicer switched from hot atom chemistry to a career in health-related applications of NMR spectroscopy, which he now pursues at Duke University. Bill Breckenridge was thought by the hiring committee to be a solution phase inorganic chemist but has become well-known instead as a chemical physicist interested in excited states of gas phase species. Jack Simons had been pigeonholed by the hiring committee as a statistical mechanics expert but developed into a world authority on the quantum mechanics of negative ions. Josef Michl was the only member of this group of gifted young chemists who did not surprise the faculty in his choice of research problems, because from the very beginning his interests were spread over a broad range of topics in theoretical and experimental organic and physical chemistry.

Another important addition to the faculty in 1969 was Goji Kodama. He was Bob Parry's principal research coworker for many years in the Research Professor ranks. Later Goji became a full professor and in that capacity taught many students the intricate techniques of vacuum line synthetic inorganic chemistry. Goji retired in 1996.



The fruits of recruiting while Dave Grant was Chairman of the Department were impressive, as he was able to hire seven capable and accomplished scientists in a short amount of time, from 1969 to 1972 (From left to right: Stang, Poulter, Wang, Spicer, Michl, Breckenridge, and Simons).

Dave Grant would later be appointed to the rank of Distinguished Professor and would win the Rosenblatt Prize among many other honors. His research program in solid state C-13 NMR spectroscopy continues to be enormously productive in scientific papers, research funding, and favorable publicity for the Chemistry Department. That being said it is appropriate to remark that Dave is probably the one person who by his distinguished research, wise administrative decisions, and sagacious counsel has done the most to propel the Chemistry Department to its present prominence.

## New Chairs and New Challenges

Early in Ted Eyring's tenure as chair (1973-76) the 1973-74 University catalog listed the following faculty members in Chemistry:

Distinguished Professors Henry Eyring, Bob Parry, Cheves Walling, Professors Evan Allred, Wes Bentrude, Bill Cagle, Bill Epstein, Ted Eyring, Jean Futrell, Pete Gardner, Cal Giddings, David Grant, Frank Harris, Ron Ragsdale, and Austin Wahrhaftig, Associate Professor Josef Michl, Assistant Professors Bill Breckenridge, Steve Hadley, Dale Poulter, Jack Simons, Len Spicer, Peter Stang, and Jim Wang

At this time Millie Trevithick was the department secretary. She had had many years of experience in the Physics Department and ran the business of the Chemistry department both efficiently and pleasantly.

Frank E. Harris is a theoretical chemist with interests in the electronic structures of atoms, molecules and solids. His work has ranged from the development of new calculational methods to detailed studies of specific systems that can be related to experiments. Some of the present day superstars of theoretical chemistry-including H.F. (Fritz) Schaefer (Georgia), Howard Taylor (USC) and Josef Michl (Colorado)-got some of their early research experience in Frank's research group. At the University of Utah, Frank was first appointed to the faculty in Physics and later had a joint appointment in both Physics and Chemistry. Frank was also Dean of the College of Science in the early 1970's. He resigned his faculty appointment in Chemistry in 1998 but still has a part-time faculty appointment in Physics.

During his three-year chairmanship, Ted Eyring had the opportunity to hire only one new faculty member, Professor William (Bill) A. Guillory. Bill had a Ph.D. from UC Berkeley, and was a tenured faculty member at Drexel University in Philadelphia. He had a strong chemical physics research operation involving a variety of laser spectroscopic tools. Bill joined the University of Utah faculty in 1974 and assembled a big group of research co-workers located in the general vicinity of the present high vacuum surface spectroscopy lab in the North Wing. Bill has a truly charismatic personality. With his extraordinary leadership skills it made sense for him to become chairman in July 1976, just two years after joining the faculty.

Bill had the opportunity to hire three members of the present faculty: Richard D. Ernst (1977), Joel M. Harris (1976), and Gary E. Keck (1977). Rick Ernst's research



Bill Guillory became the Department chairman in 1976 after just two years of service at the University of Utah.

program in synthetic inorganic chemistry continues to be productive and has given rise to ongoing federal funding as well as many Ph.D. students and widely cited scientific papers. Rick has also gained a well-deserved reputation for excellent teaching.

Joel Harris was awarded the rank of Distinguished Professor in the year 2000 in recognition of his extraordinary achievements as a teacher and researcher in analytical chemistry. His pioneering research in developing instrumentation to study phenomena such as fluorescence and the thermal lens effect resulted in his receiving the ACS Division of Analytical Chemistry

Award in Chemical Instrumentation in 1991. For several years now Joel has been editor-in-chief of Applied Spectroscopy, one of the most frequently cited periodicals in analytical chemistry.

Gary Keck is a demanding teacher of organic chemistry and his publications in the areas of synthetic chemistry and natural products chemistry are among the most cited in the world. Several of his former Ph.D. students are making their own mark in synthetic organic chemistry. Gary has become a vocal proponent of better digital computing opportunities for University of Utah undergraduates.

Bill Guillory also participated in the hiring of a more senior faculty member, Charles S. (Chuck) Fadley. Chuck had established a first rate XPS surface science research program at Hawaii before he joined the University of Utah faculty in 1979. After two years at the university, Chuck elected to return to Hawaii for personal reasons. The surface science expertise, which the department needed, came much later (in 1989), with the appointment of Thomas P. (Tom) Beebe, Jr.

Bill Guillory also devoted a great deal of energy and time to promoting the reputation of the department throughout the world. He was first to start the comprehensive matching of faculty with national and international awards, identifying every award available in chemistry and chemical physics that related to University of Utah faculty expertise. That first year the number of awards made to university faculty members went up by more than 300%. This approach has since been institutionalized in the department by a standing Awards Committee, presently chaired by Joel Miller.

Bill also began a formal program of bringing in undergraduate students to do summer research for possible recruitment into our graduate program. That program produced 20% to 33% of our new graduate students of the period. This program was institutionalized under the direction of Associate Chairman Richard (Rick) Steiner, who was hired by Guillory to be the first permanent associate chairman for the department in the summer of 1977.

Toward the end of his chairmanship, Bill successfully negotiated an agreement with President David P. Gardner to fund the South Wing addition to the Chemistry Building. The Chemistry South Wing did not get to the top of the State Building Board construction priority list while Bill was chairman, but President Gardner did follow through later on this commitment to Bill. The Chemistry Department was fortunate that the university was presided over by a person favorably disposed toward the physical sciences at the same time that Chemistry had a chairman who was an especially gifted negotiator. Bill stepped down as Chairman on July 1, 1979. He resigned his professorship in 1986 to begin working full time in his own consulting company, Innovations International, which continues to prosper in Salt Lake City.

## Further Pooling of Resources

Professor Josef Michl succeeded Bill Guillory in 1979 as Chairman. In 1978, Josef published eighteen research papers back-to-back in a single issue of "JACS" [J. Am. Chem. Soc. 100, 6801-6898 (1978)]. This phenomenal research productivity was just one highlight of his years (1971-1987) as a faculty member at the University of Utah, but it suggests the dynamic impact he had on research in the department as Chairman from 1979-1984. The growth in research activity exacerbated the need for more laboratory space. Professors Michl, Frank Harris and Austin Wahrhaftig therefore documented the detailed space needs in a proposal that Professor Michl carried to President David P. Gardner. This document reinforced the President's determination to go ahead with an expansion of the still fairly new Chemistry Building. Professor Austin Wahrhaftig played a critical subsequent role in the design of the new South Wing, which was completed and opened in 1986. There is a wall plaque in the vestibule to the South Wing (second floor) that honors Austin for his thoughtful design work on both wings of the Chemistry building.



Hans Morrow, the Department glassblower for over thirty years, busy at work.

Another important legacy of the Michl years is the use of departmental resources to build and maintain technical services (electronics shop, machine shop, glassblowing shop, optical spectroscopy services, x-ray diffraction services, NMR services, mass spectroscopy services, digital computing services, etc.). It is these resources that are the envy of major chemistry departments throughout the United States. At the time that Josef began this change in departmental spending habits, it was more the rule that each faculty member involved in research secured his or her own major pieces of equipment for new research initiatives. The pooling of resources through departmental cost centers fostered by Josef has had an obvious beneficial effect on the growth of research in Chemistry at the University of Utah. One of the reasons that the shared

use concept has worked so well is that scientists/engineers have been hired by the department to supervise the use and maintenance of this instrumentation and in some cases actually to run experiments on these instruments for research students. It would be difficult to list all the talented people who have served in this capacity over the past 20+ years. Persons currently (Oct. 2000) charged with these responsibilities include Dr. Elliot Rachlin (mass spectroscopy), Dr. Atta Aarif (x-ray crystallography), and Dr. Charlie Mayne and Dennis Edwards (NMR and EPR spectroscopy).

Another key to the strength of the University of Utah's chemistry research program has always been the high quality of the services offered by the department shops. The talented people presently heading up these services are Dale Heisler (electronics shop), Dennis Romney (machine shop), and Janice Kyle (glassblowing shop). From an historical point of view, one of the greatest stories in the technical services area at the University of Utah is the 30+ year term that Hans Morrow served as the glassblower (for the entire campus) before his retirement in 1998. In addition to being able to make or mend every conceivable form of scientific glassware, Hans was Chemistry's resident chess champion and all-around nice guy.

Not all of Josef's innovations took root. Josef initiated "Utah Chemistry Workshops" held at our mountain resorts. At these five-day meetings attended by most of our faculty and graduate students, the principal speakers were a combination of local faculty and distinguished scientists brought in for the occasion. For instance, in September 1981 Geraldine Kenny-Wallace (University of Toronto) and Stephen R. Leone (University of Colorado) were among the invited speakers addressing various aspects of "Lasers in Chemistry," the topic of this particular workshop. In September 1983, the title of the workshop was "Gas Phase Ion Chemistry Mass Spectrometry." In September 1984, the name of the workshop was simply "Biological Chemistry." Attendees at these workshops were generally enthusiastic. The workshops disappeared from the Chemistry Department annual program because of their cost.

During his five-year tenure as Chairman, Josef made an important administrative change that has had a long lasting positive impact on the Chemistry Department. Rosemary Laufer assumed her present day duties as Administrative Assistant to the Chair.

In December of 1980, the University gave the name of Henry Eyring to the Chemistry Building (North Wing). The occasion was marked by a ceremony in the foyer of the building at which Professor Richard B. Bernstein was the invited speaker.

Professor Henry Eyring also spoke humorously and was clearly appreciative of the great honor of having a building named after him. The tradition on the University of Utah campus was to name buildings either for former presidents of the university or for major financial donors to the university, or persons who have passed away. Henry Eyring did not qualify on any of these counts. At the building dedication Henry told the following apocryphal story:

"As I was dozing lightly in my office some weeks ago, in walked President Gardner unannounced with one of the Regents. They strode around me and my desk several times, clucking softly and looking at me very closely. Finally President Gardner said to the Regent, 'Yes, I think he is close enough', and the two of them exited my office without another word. They evidently concluded on that occasion that I was near enough dead that I could cause the University no further embarrassment if they named a building after me."

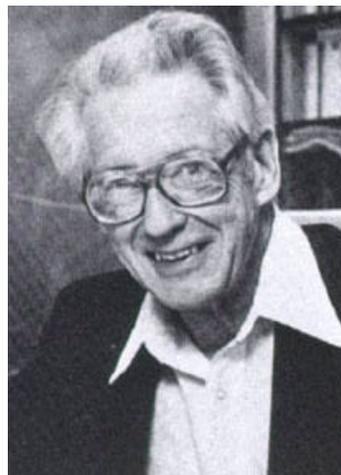
Henry Eyring died in late December 1981 while still serving as a full-time member of the Chemistry faculty and principal investigator of a major research grant that funded the last of his students, Allan Peoples. Allan completed his Ph.D. dissertation several years later with the generous help of Dennis Caldwell.



Henry Eyring at the dedication of the Chemistry Building, named in his honor in 1980.

In 1982, Bob Parry served as the elected president of the American Chemical Society. His three-year tenure as president-elect, president, and immediate past-president of the Society afforded the Chemistry Department positive visibility in the international chemical community that one can get in no other way.

Josef Michl had the opportunity to make several faculty appointments during his five-year tenure. Randy Shirts, a theoretical chemist, and Jim Takacs, an organic chemist, were appointed to the rank of Assistant Professor in 1982. Randy is now a professor at Brigham Young University, and Jim is a professor at Nebraska.



In honor of Dr. Parry, a teaching award was instituted by the Chemistry department, with the generous help of Dr. Rodney H. Brady and Carolyn H. Brady.

John Gladysz was also appointed to the faculty in the rank of Associate Professor in 1982. John went on to publish many scientific papers at the University of Utah and won the ACS Award in Organometallic Chemistry in 1994. One of the many ways that Josef Michl drew favorable attention to the University of Utah was by editing Chemical Reviews, an influential monthly periodical of the American Chemical Society. Josef enlisted John Gladysz as co-editor. It was a blow to the department in 1998 when John Gladysz accepted a chaired professorship at the University of Erlangen/Nürnberg in southern Germany.

B. Stanley Pons was hired as an associate professor in 1983. Stan came to the department from the University of Alberta at Edmonton and brought a strong electrochemical research program to the department. He had already made a reputation for innovation with his work on microelectrodes and for his refinement of IR spectroscopy of adsorbed monolayers on electrodes viewed through an exceedingly thin layer of electrolyte solution. A little less than five years later, he served an eleven-month term as department chair.

Another Michl appointment was Charles A. (Chuck) Wight to the rank of assistant professor in 1984. Chuck is a physical chemist with a pre-Utah background in infrared spectroscopy and gas phase ion chemistry. At the University of Utah Chuck has built a strong research program in explosives and in thermochemistry generally. For instance, his students can tell from thermogravimetric measurements how long aspirin retains its efficacy

in dry Utah weather compared to a warm, humid climate. Chuck has become the campus guru concerning courses taught over the Internet. He also served in the influential but time-consuming role of President of the University Senate in 1999-2000.

Ted Eyring served a second term as department chair from July 1, 1984, to June 30, 1985. The following memo to the Chemistry faculty dated November 2, 1984, typifies Ted's notion of what should interest a faculty member:

Federal Research Dollars Per Full Time Faculty  
Member in Chemistry, 1982

<u>Ranking</u>	<u>University</u>	<u>Dollars/ Fac. Member</u>	<u>Ranking</u>	<u>University</u>	<u>Dollars Fac. Member</u>
1	Stanford	\$ 298.7 k	26	Purdue	\$ 82.2 k
2	M.I.T.	293.4	27	Colorado	81.0
3	Columbia	242.6	28	Minnesota	75.0
4	Johns Hopkins	211.1	29	So. Calif.	74.7
5	Cal. Tech.	187.4	30	So. Carolina	74.6
6	Harvard	181.5	31	Nabraska	68.8
7	Cornell	181.2	32	Massachusetts	67.6
8	Notre Dame	154.5	33	Maryland	66.7
9	Rochester	132.1	34	Texas Austin	66.2
10	Illinois	125.3	35	Ohio State	63.7
11	Chicago	123.9	36	SUNY Stony Brook	61.3
12	Indiana	117.7	37	Georgia Tech.	60.0
13	Princeton	113.0	38	Syracuse	58.1
14	Northwestern	113.0	39	Wayne St.	58.0
15	UCLA	110.6	40	Rensselaer	57.5
16	Pennsylvania	109.8	41	Lehigh	56.6
17	Yale	108.3	42	SUNY Buffalo	56.6
18	Calif. San Diego	103.1	43	Arizona St.	55.4
19	Utah	102.1	44	Texas A&M	54.3
20	Calif. Berkeley	101.6	45	Michigan St.	53.9
21	Penn. State	87.6	46	Washington	52.2
22	Oregon	93.7	47	Iowa	52.0
23	Wisconsin	92.0	48	Florida St.	38.8
24	Colorado St.	85.8	49	Oklahoma	38.1
25	Pittsburgh	84.2	50	Florida	31.9

The following table from the same period casts the University of Utah Chemistry Department in an even more favorable light.

### ACS Directory of Graduate Research, 1985

Rank	Name of School	No. of Faculty (F)	No. of Publications (P)	Avg. P/F
1	Stanford	26	368	14.15
2	Cal. Tech.	25	344	13.76
3	M.I.T.	33	438	13.27
4	Columbia	17	225	13.24
5	California, Berkeley	56	735	13.13
6	Northwestern	29	347	11.97
7	Harvard	24	287	11.96
8	Cornell	32	375	11.72
9	Princeton	19	211	11.11
10	Chicago	29	320	11.03
11	Texas A & M	50	544	10.88
12	Texas	47	492	10.47
13	Georgetown	17	168	9.88
14	Utah	32	301	9.41
15	Indiana	37	346	9.35
16	California, Riverside	16	149	9.31
17	SUNY, Buffalo	29	266	9.17
18	Pittsburgh	29	266	9.17
19	Illinois, Urbana	44	388	8.77
20	Yale	27	226	8.37
21	Pennsylvania	26	212	8.15

During Ted's one-year second turn as chairman, two new Assistant Professors joined the faculty: Michael Morse and Thomas (Tom) G. Richmond. Michael had been a graduate student at Chicago in theoretical chemistry and then a post-doc in the Smalley group at Rice. At the University of Utah he and his students have become well known for their elegant laser spectroscopy of metal atom clusters in the gas phase. Michael has won the University-wide Distinguished Research Award (1997) as well as the Distinguished Teaching Award (1999). Each of these awards is made to only a very few faculty members each year and Michael is the only Chemistry faculty member who has managed to win both awards.

Tom Richmond is a synthetic inorganic chemist who earned his Ph.D. at Northwestern and did postdoctoral work at Cal Tech. He shared the ACS Nobel Laureate Signature Award for Graduate Education with his Ph.D. student, J. L. (Jackie) Kiplinger, in

1998. His research has focused primarily on the synthetic organometallic chemistry of fluorocarbons.

The appointments of Michael and Tom became effective on July 1, 1985. On this same day one of the mainstays of the department staff retired after more than 30 years of service. Gordon Hale had done a truly first class job of running the stockroom and other business aspects of the department and was honored by an open house that day in the HEB foyer.

Jack Simons began serving as department chairman on January 1, 1986. In the spring of 1986 the Chemistry faculty members were delighted by the election of Professor Josef Michl to membership in the National Academy of Sciences. Joy gave way to dismay shortly thereafter when Josef accepted a very attractive job offer from the University of Texas at Austin.

The following news article from the Sunday, November 9, 1986 issue of the Salt Lake Tribune, page 10B, captures the general tenor of that time nicely:

## Lack of Resources Prompts U. Professor to Leave Post

Chemistry professor Josef Michl's reputation among his peers as a world-class scientist has made him a crown jewel of the University of Utah faculty.

But Dr. Michl has become booty in what U. officials say is a national raid on their College of Science. He has left Utah's flagship state university for the University of Texas at Austin, taking five top graduate students and half a million dollars in annual federal research grants with him.

One department head said further funding cuts could spark faculty members throughout the university to quit "in droves."

Dr. Michl's decision is an especially hard blow to the College of Science, which already has lost seven professors to other universities this year. He is an elected member of the prestigious National Academy of Sciences and has lectured at numerous international symposia, both markers of his standing in the global scientific community.

"Michl is the most visible, internationally recognized scientist we have in our department. His loss was a major one," said Jack Simons, chairman of the U. Chemistry De-



Josef Michl

partment. "Almost immediately people all over the world were asking, 'Why?'"

His and other departures from the College of Science means the loss of \$25 million in federal research money — 23 percent of the external funding coming into the college. Remaining faculty members fear that major out-of-state universities will continue to outbid Utah in salaries, equipment and facilities, causing a brain drain of world-class scholars and scientists at the state's largest research university.

Dr. Michl, who has worked 19 years for the U., points with pride to his department's national ranking by an independent rating association as 19th in overall quality, earned over two decades. But he fears that if budget cuts continue, quality programs could deteriorate.

"Quality at a university is like a charmed circle," said Dr. Michl. "To attract top faculty and graduate students, the university must have a good reputation. To get a good reputation you have to have excellent faculty, and to get that, you have to have good equipment and facilities, and so on. It takes many years to break into the circle and only a few years to fall out."

The offer that attracted Dr. Michl to the University of Texas is part of a package that could boost the Austin chemistry department to become the nation's best. Ironically, current ratings for chemistry departments at both the Austin and Salt Lake City campuses are similar.

"It's obvious Michl didn't believe Utah could break into the top ranking because of our resources," said Joseph L. Taylor, dean of the U.'s College of Science. "We've lost so many people, it's also obvious that we're being raided."

Besides Dr. Michl, four math professors, two biology professors, one physics professor and another chemistry professor have left the U. College of Science for other universities this year. Faculty members are extremely nervous, said Dean Taylor. "Morale is so low, it wouldn't take much more in the way of bad news from the state for people to start bailing out in droves."

For Dr. Michl, the Texas offer included \$750,000 to remodel the university lab, more money for lab start-up costs, and a 75 percent salary increase. Utah's counteroffer for salary fell short of the Texas bid by 40 percent.

"I live comfortably and I can only drive one car at a time. My own salary wasn't a big factor in my leaving," said Dr. Michl. "But salary freezes in Utah have been a concern because salaries attract and keep good faculty. It's vital to work in a good environment."

More importantly, the Texas offer includes a \$1 million endowed chairmanship, which guarantees that research money will be available, flexible, and independent of federal grant funding. The U. of U. Chemistry Department has tried unsuccessfully for five years to obtain a similarly endowed chairmanship. Texas also has a better library.

Despite near-record unemployment in their state, Texas University officials say they've been able to avoid salary freezes and set up endowments, partly because of income the higher education system receives from managing two million acres of land. The state's governing board of regents has matched more than 900 endowments from business and individuals the past few years, 65 of them worth \$1 million.

By contrast, the U. has had to absorb seven budget cuts in 10 years.

Dr. Michl said his decision to leave Utah was influenced by previous budget cuts and was reached long before Gov. Norm Bangerter told educators to trim another three percent to make up for \$48 million in revenue shortfalls. Dr. Michl is quick to add, however, that U. of U. administration has been supportive, he's grateful for experiences at the university, and Utah is a beautiful place to live.

"It's difficult to single out one particular event or reason that influenced my decision to leave," he said. "I suspect that's true for others as well."

Other contributing factors for Dr. Michl were worsening winter pollution and large class sizes for his two children, once enrolled in Utah public schools.

"I understand that the Utah taxpayer pays more than he would in most states for education, but with such large families, it's difficult for the money to go to improve quality," he said. "I've worked as a visitor at six other universities so I am somewhat qualified to say that if Utah had the money other universities do, this university could accomplish wonders. As it is, it's a struggle to make the money go beyond funding growth."

The U. isn't "fatally wounded yet," according to Dean Taylor. Only three math departments west of the Mississippi have achieved rankings as high as the U.'s and its chemistry department is ranked even higher. Both its biology and math departments were ranked first last year for showing the most improvement among public and private universities across the nation.

But if the number of professors leaving the U.'s College of Science approaches even 10 percent, the college could lose 75 percent of its research dollars, "and then, we might as well lock up the labs," said Dean Taylor. "We can't continue to be a top-rated research university unless we're prepared to offer the necessary resources to get the job done. What I'm saying is we're at risk if we can't turn things around."

The article mentions an "endowed chairmanship" when what is meant is an "endowed chair". A university invests an endowment of a million or more dollars in securities, and part of the income each year from the endowment is spent by the chairholder on her/his research. Professor Robert Parry and others have succeeded in raising more than \$1.25 million from private donors to fully fund the Henry Eyring Presidential Endowed Chair in Chemistry. This success came in the year 2000, nearly 14 years after Josef Michl expressed pessimism to the writer of the news article above. There is another endowed chair in the Chemistry department called the John A. Widtsoe Chair, created for Prof. Dale Poulter at a time when

he was contemplating a very attractive job offer from Indiana University. The Widtsoe Chair was one of four chairs funded by the President of the University from research grant overhead money rather than from private donations.

During Jack Simons' chairmanship the department expanded into the new south wing of the HEB. Jack recognized this as a good opportunity to recruit new faculty members because of the availability of this new resource. Thus he led the recruiting of three new people: A biochemist, Thomas C. (Tom) Alber, and two physical chemists, Peter Armentrout



Faculty members in 1987 (starting in back, left: Tom Richmond, Michael Morse, Ron Ragsdale, Chuck Wight, Rick Ernst, Evan Allred, Dale Poulter, Wes Bentrude, Bill Epstein, Peter Armentrout, Stan Pons, Ted Eyring, Jack Simons, Goji Kodoma, Bill Breckenridge, and Joel Harris.

and A. D. J. (Tony) Haymet, were all appointed in 1987. Tom Alber's appointment as an assistant professor was shared between both the Chemistry and the Biochemistry Department. Five years later Tom accepted a position in Structural Biology at Berkeley.

Peter Armentrout had earned a Ph.D. at Cal Tech in the lab of Jack Beauchamp, done postdoctoral work at Bell Laboratories, and been a faculty member at the University of California Berkeley for several years before coming to the University of Utah in 1987 as Associate Professor. His research using high vacuum instrumentation has elucidated the thermodynamics of a wide range of gas phase systems. For instance, he and his co-workers have explored the interactions of simple metal cations with crown ether ligands in ways that

complement the efforts of chemists working with these systems in the liquid phase. Peter's work is so widely cited by other scientists that he ranked 84<sup>th</sup> by total citations among 627,871 chemists world-wide in the interval between 1981 and June 1997. Peter was awarded the rank of Distinguished Professor in 1998. In addition to all of these accomplishments, in November 2000, Peter was named the Chemistry Department Chair effective January 2001.

Tony Haymet was also a junior faculty member at UC Berkeley before coming to the University of Utah, also in the rank of Associate Professor. His expertise is in the theory of liquids, specifically liquid water. After a few years at the university, Tony accepted a chaired professorship in his native Australia. He has since become a Distinguished Professor at the University of Houston in Texas.

The space in the new south wing made it possible to install the first departmental computer used for theoretical simulations and the appointment of a full-time staff member to supervise the computing facility. (In the late 1990's the theoretical chemists were given new facilities in the INSCC building, and the facility in the Chemistry Department was adapted to the ever-increasing demands for computation by all groups in the department.) In addition, the new wing provided space for new electronics, machine and glass blowing shops, as well as for research operations of new faculty. Although state budgets were very lean during these years, the department leadership was able to move several staff positions (e.g., in shops and instruments facilities) from soft to hard funding and to have the technical support staff take on additional financial responsibility for the operation of their facilities. Even with all of the turnover in the Chemistry department faculty, external funding continued to grow. These new faculty members also gave the department the opportunity to remodel some of the laboratory space in the North HEB.

Stan Pons succeeded Jack Simons as Chair on May 9, 1988. The appointments of Walther R. Ellis, Jr., Gary F. Holland, and Fred G. West as Assistant Professors all became effective in the spring of 1988. Walther's expertise is in bioinorganic chemistry. He and his students did some beautiful studies of the protein hemerythrin from marine peanut worms before he moved to Utah State University in 1994. Gary Holland elected to take a job with an industrial research company in Redmond, WA (near Seattle) after two years on the University of Utah faculty.

Fred West is an organic chemist with a strong interest in the total synthesis of biologically important natural products using new organic reactions discovered in his laboratory. He and Chuck Grissom [see below] founded a company that explores the use of vitamin B-12 as a "Trojan horse" for introducing anti-cancer drugs into cancer victims. The eventual commercial success of this company would benefit the University through the payment of royalties for use of patented technology invented by West and Grissom. Many Chemistry faculty members (including Christensen, Epstein, Giddings, F. Harris, Poulter, and Wang) have formed off-campus companies following this general model. Fred West's wife, Dr. Christine Brzezowski, is an admired and much-awarded teacher in the undergraduate organic chemistry program of the department.

Another very important appointment made in 1989 during Stan's brief tenure as Chairman was that of Jack Simons as the first Henry Eyring Endowed Chairholder (the Chair was not fully funded at that time). This was the first endowed professorship in the history of the Chemistry Department. The event was marked by a beautiful reception in the backyard of the Rosenblatt House (the home of the University President). Jack remarked that: "This was the most proud and appreciated I have ever felt because this honor was bestowed by my friends and colleagues and because Henry was America's premier theoretical chemist." Jack did honor to the Henry Eyring Chair both by publishing many first rate scientific papers as the chairholder and by fostering a variety of programs for students using some of the financial proceeds from the Chair endowment. When Jack elected to begin phased retirement in 1998 and resigned the Chair, it was allowed to remain vacant while additional endowment funds were solicited. The Jon Huntsman family and the L.D.S. Foundation, through the offices of Dr. Rod Brady, generously completed the funding of the chair in the year 2000. A new chairholder has not yet been appointed.

Stan Pons did his doctoral dissertation research at Southampton University, where he developed a scientific collaboration with Professor Martin Fleischmann. In the 1980's Martin was a frequent visitor to Utah and had been given a courtesy visiting professorship at the University of Utah. On March 23, 1989, a press conference was convened at the University of Utah by President Chase N. Peterson to announce the discovery by Stan and Martin of cold fusion. The euphoria and disillusionment that followed that event have been told in many subsequent newspaper articles and books. A recent 365 page book [Charles G.

Beaudette, Excess Heat: Why Cold Fusion Research Prevailed, Oak Grove Press, South Bristol, Maine, 2000] does a balanced job of recounting the story.

Stan Pons resigned from the chairmanship in mid-year to devote all of his professional time to cold fusion research, and Joel Harris unselfishly undertook the duties of Department Chairman from March 29 to September 14, 1989.

The appointment of Tom Beebe as an Assistant Professor began on January 26, 1989. Tom was a brand new Ph.D. from Pittsburgh who immediately went to the Lawrence Berkeley Labs to carry out postdoctoral research in Gabor Somorjai's laboratory. Tom's subsequent work at the university with various scanning probes investigating "molecular corrals" on solid surfaces has drawn a great deal of favorable international attention. Tom has also invested a lot of effort in the creation of a multi-user surface analysis laboratory with a wide variety of high vacuum instruments (e.g. XPS and SIMS) costing well over a million dollars.

The appointment of Charles (Chuck) B. Grissom as an Assistant Professor began on July 1, 1989. Chuck has research interests that range from biochemistry to analytical chemistry. He has made a name for himself by exploring the initiation of radical reactions by photoexcited coenzyme B-12. In 1994, he reported the first observed magnetic field effect on an enzymatic reaction.

Peter Stang began his six years of service as Chairman on September 15, 1989. Among Peter's most important accomplishments as Chairman was his resolution of the cold fusion dilemma. Stan Pons wished to be relieved of his professorial teaching duties while working full time on cold fusion research. Peter negotiated an arrangement in which Stan resigned his tenured professorship effective Dec. 31, 1990, and subsequently vacated a Research Professor position effective June 30, 1992. In November 1992 a beautiful new laboratory near Nice, France, funded by Japanese business interests was dedicated to house the continuing cold fusion research of Stan and Martin. Several years later the University of Utah sold its rights to cold fusion patents to a private company. As of June 2000, Stan Pons is no longer doing research in Nice. Stan is a French citizen and resides with his family in southern France. Martin Fleischmann, on the other hand, in the spring of 2000 was still actively exploring theories of cold fusion and gave a scientific talk at the international cold fusion conference held in Italy.



Maurine Liddiard, the Administrative Manager from 1988 to 1996, in a candid photograph with Joel Harris, in 1991.

Janet Wisniewski-Grissom was appointed to the rank of Assistant Professor on May 29, 1990. She was the first female, tenure track faculty member in the Chemistry Department. She got off to a strong start with her organic chemistry research before resigning her faculty appointment to become a student at the University of Utah Medical School. She is now an M.D. specializing in psychiatry.

In 1992 Chemistry Department faculty members were delighted to bask in the reflected glory of Professor Bob Parry, selected that year to receive the Priestley Medal of the American Chemical Society. This highest award of the American Chemical Society was conferred on Bob for his extraordinary contributions to chemistry as a researcher, teacher and leader of the international chemical community. He did not stop giving at that point to the quality of the Chemistry Department. He continued to teach large undergraduate classes through 1994 and was highly praised by his undergraduate students to the very end of his long teaching career. Thanks to the generosity of the Rod Brady family, an annual Robert W. Parry Teaching Award was established in 1990 and first given to Bill Breckenridge. The award is made each year to an outstanding teacher in the Chemistry Department.

Professor Joel Miller joined the Utah faculty in 1992. Joel had been at DuPont in Wilmington, DE, where he had discovered organic molecular solids that are ferromagnetic. This research, which he has greatly expanded upon at the University of Utah with a large, well-funded research team, brought him the prestigious American Chemical Society Award in the Chemistry of Materials presented at the San Francisco ACS meeting in March 2000.

Thanh N. Truong was appointed to the rank of Assistant Professor at the University of Utah in 1992. He has developed a range of calculational tools for theoretical studies of combustion, solvation, zeolite catalysis, and interfaces. He was promoted to the rank of Associate Professor and granted tenure effective July 1, 1997. His early years in Vietnam as

a cigarette peddler, buffalo-boy and plowman before fleeing to the U.S. by boat are part of a great Horatio Alger story told on his web-site.

Thomas J. Curtiss also joined the faculty as an Assistant Professor in 1992. He designed, built and successfully tested an elaborate high vacuum instrument for isolating a neutral radical from plasma and shooting the free radical at a solid surface using inhomogeneous electric field focusing methods. He now works at the Aerospace Corporation as a research scientist.

In 1993, Professor Henry S. White was appointed to the university faculty and brought a very strong research program in electrochemistry to the University of Utah from the University of Minnesota. He is an Associate Editor of the Journal of Electroanalytical Chemistry, and his students are using scanning probe techniques, microelectrodes, and other methods to study topics as diverse as magnetic field effects in electrochemistry and transdermal drug delivery.

Peter Stang led the recruiting of two senior chemists late in his chairmanship. Cynthia (Cindy) J. Burrows and her husband, Scott L. Anderson, both joined the University of Utah faculty in January of 1995. They were previously full professors at the State University of New York at Stony Brook. Scott is a physical chemist who does experimental studies of gas phase reactions involving polyatomic molecules, clusters of molecules, and some surfaces. Scott has also made important leadership contributions to the recruiting of several new Assistant Professors.

The Chemistry Department sustained several significant personnel losses during the 1990's. Prof. Jim Wang severed his ties to the University of Utah in favor of an endowed chair at Nebraska in September of 1990. Prof. Evan L. Allred died of cancer (at age 62) on July 8, 1991. In the course of almost thirty years on the University of Utah faculty, Evan had taught countless undergraduates in organic chemistry while publishing some excellent scientific papers on the synthesis and properties of strained ring organic molecules. Prof.



Cindy Burrows is a noted bio-organic and bio-inorganic chemist known for studies of the intercalation of drugs and many different metal-peptide species in DNA and RNA strands and oxidation reactions of DNA by metal ions commonly found in the environment.

Cheves Walling retired from the faculty in 1991. Dr. Jerry Mitchell, the long time head of the department electronics shop, passed away on March 23, 1994. Professor Walter J. (Jim) Horton died on December 17, 1994. Jim was a faculty member at the University of Utah from 1946 until 1986 with two interruptions to serve as chair of the Chemistry Department at Haile Selassie University in Ethiopia (1963-65) and to serve on the faculty of the University of Ife in Nigeria (1968-71). One of his more unusual abilities as a teacher of undergraduate organic chemistry was his facility for rapidly writing formulas and equations on the blackboard while erasing simultaneously with the other hand. For the stenographically challenged students, this posed an interesting problem. Jim had a number of outstanding Ph.D. students, including Pete D. Gardner, mentioned earlier. For many years late in his career Jim collaborated closely in research with the David Grant NMR group.

Throughout this tumultuous six-year period (1989-1995) in the history of the Chemistry Department Peter Stang kept his own research program moving ahead rapidly with the aid of a number of talented students. Their work on the synthesis and properties of so-called molecular squares particularly generated widespread interest. From 1982 through 1999 Peter also carried the heavy load of Associate Editor of the Journal of the American Chemical Society. In the spring of 2000 he traded this responsibility for the even more



Jim Horton standing in front of the old chemistry building around 1960.

demanding task of being Editor-in-Chief of the Journal of Organic Chemistry. Peter has accumulated honors that include being only the fifth U.S. scientist ever awarded an honorary degree by Moscow State University, the preeminent university in Russia. In 1995, he won the University of Utah Rosenblatt Prize for Excellence (other winners of this prize from Chemistry are David Grant and Dale Poulter). Peter was named the James Flack Norris Awardee in Physical Organic Chemistry of the national American Chemical Society in 1998. In the year 2000, Peter was elected to the U.S. National Academy of Sciences. This last honor is especially

impressive since only three chemists were elected in the year 2000 and the demographics of the Academy weigh heavily against anyone being elected who does not reside either on the East or West Coast.

Utah ranked 22<sup>nd</sup> among all U.S. and Canadian Chemistry Departments in the number of publications per faculty member in the 1991 ACS Directory of Graduate Research. In 1993, the Gourman Report ranked the University of Utah Chemistry Department 22<sup>nd</sup> in graduate education nationwide. The University of Utah ranked 7<sup>th</sup> (behind Harvard, Stanford, Northwestern, Columbia, UT Austin, and Houston) in the average number of publications per faculty member in the 1993 ACS Directory of Graduate Research.

## Poulter to Present

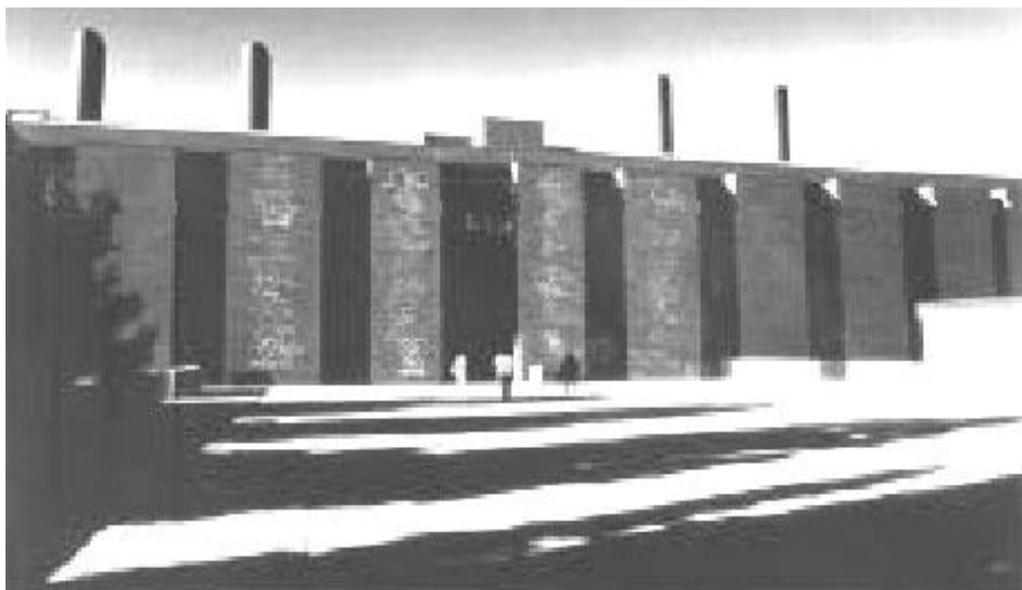
In July 1995 Professor C. Dale Poulter became the Chairman of the Chemistry Department. Dale has a large, productive research group and an international reputation for creative research. The group studies the 40-step reaction sequence that the human body uses to manufacture cholesterol. His important discoveries continue to make very positive news for the Chemistry Department. In addition, he received the Ernest Guenther Award from the American Chemical Society for his work in isoprene metabolism. Among his other duties, Dale is a Senior Editor for the Journal of Organic Chemistry and Associate Editor for the new Journal of Organic Letters, where he handles manuscripts in the developing area of bioorganic chemistry.

There have been a number of important milestones in the course of Dale's tenure as Department Chair. Finishing off the fund raising for the Henry Eyring Endowed Chair in 1999 was a major accomplishment, and the establishment of the Giddings Lectureship was another important achievement. Dale's initiation of "annual" overnight faculty retreats to brainstorm new directions for the department promises to have valuable long-term effects. For instance, we are now getting better control of seminar scheduling that at one recent point threatened to inundate the department with multiple seminars almost every working day. The department also survived the transition from academic "Quarter" to "Semester" scheduling in Autumn, 1998 with very few hiccups. Bill Breckenridge and Dave Grant are numbered among heroes of this sometimes-divisive event in the history of the University.

The department sustained a major blow when Professor J. Calvin Giddings died at age 66 on October 24, 1996. Cal was internationally known for his many contributions to chromatography and the broader field of separation science. He was the author or co-author of over 400 scientific publications and the editor of thirty-two books. Cal pioneered classes focused on environmental issues before these concerns became widely fashionable. He was also an indefatigable mentor of many graduate research students who learned from him the intricacies of various forms of chromatography, including field flow fractionation (FFF), a concept that Cal invented which became his primary identifier late in his career. Over the years he raised a great deal of federal research money. In another dimension, as a younger scientist Cal was renowned for his skiing and daring rock climbing. In later years he

persisted in his enthusiasm for outdoor adventure with kayaking trips in the U.S. and on the Apurimac River in South America, and still later he got into mountain bike riding.

Professor Austin L. Wahrhaftig, about whom much has already been written above in this history, passed away on November 11, 1997.



View of the South Wing of the HEB in 1996, the week of graduation. As a going away present several anonymous undergraduate students clandestinely rappelled from the roof of both wings of the HEB in the middle of the night and decorated the walls and walkway with numerous chemical equations and figures using chalk. The trick was repeated again in 1997

Professors Bill Epstein and Frank Harris retired from the Chemistry Department faculty in 1998 and Wes Bentrude began phased retirement in 1998. The daunting challenge faced by the Department Chairman and the faculty is to hire new faculty members to get the teaching job done while also improving the quality of the research program in the department. This problem is aggravated by the growing difficulty of competing with other excellent departments who in some cases can throw as much as a million dollars in so-called start-up funds at a brand new Assistant Professor. These start-up funds were once very modest. Ted Eyring was given \$7,000 to establish his research program when he was hired as an Assistant Professor in 1961. In the intervening years there has been a steady inflation of the dollar not commensurate with the jump from \$7,000 to the presently prevailing start-up package cost at the University of Utah of \$300,000 to \$600,000 dollars. In Utah, the start-up money comes almost entirely from "returned overhead" on federal research grants. In other words, if a faculty member secures a research grant from the Department of Energy in

the amount of \$100,000, the University as "overhead" holds about \$33,000 of that money back. It is this money that funds start-up packages for new faculty. The reason for injecting this budgetary pessimism into a "history" is that it helps the reader to make sense of the heavy emphasis of this history on who has been hired and who has retired, or otherwise left.

Before leaving the topic of research funding, we should draw attention to the October 30, 2000 issue of Chemical Engineering News. On page 58 of that issue the University of Utah is ranked 26<sup>th</sup> (in the year 1998) among universities and colleges in the United States with the most federal support for chemical research and development. That is up from a ranking of 34<sup>th</sup> in the previous year, 1997.

As chair, Dale Poulter has been the leader in the recruiting of several new faculty members. Assistant Professors Peter Beal and Sheila David joined the faculty in July 1996. Sheila is a bioinorganic chemist who brought an active research program from U.C. Santa Cruz, where she had taught for several years. Peter Beal came to the University of Utah from a postdoctoral research stint at Harvard. He is a bioorganic chemist interested in how small molecules interact with nucleic acids and proteins. They have become a husband and wife team since joining the University of Utah faculty.

Professor Gregory A. Voth came to the University of Utah in 1997. He was previously a professor at the University of Pennsylvania. At the "U" he has assembled a very large group of co-workers who are housed in the new INSCC building. Greg is the Director of the now-formalized Henry Eyring Center for Theoretical Chemistry and spends his very large federal research budget on fundamental theoretical studies of the dynamics of complex condensed phase systems.

More recent arrivals at the University of Utah include the following Assistant Professors: Matthew S. Sigman (1999), an organic chemist who came from a postdoctoral research experience at Harvard; Eric L. Hegg (1999), an inorganic chemist who came from a postdoctoral appointment at the University of Minnesota; John C. Conboy (2000) who was most recently a postdoctoral researcher in analytical chemistry at the University of Arizona.

An obvious deficiency of the above record is the focus on faculty rather than on former students. There is no easy remedy to this problem. Many of our former undergraduate, graduate, and postdoctoral students have gone on to spectacular careers in a broad range of professions. One of the few reliable mechanisms for getting reports of

successes of former students is through their generous donations to the Henry Eyring Endowed Chair and other department Development Funds. W. Hoyt Andersen (Ph.D. 1952), Carlos M. Bowman (Ph.D. 1957), Melvin C. Cannon (M.S. 1938), David T. Chuljian (Ph.D. 1984), Bradley W. Cromar (B.A. 1982), Edward M. Eyring (Ph.D. 1960), David M. Grant (Ph.D. 1957), Taejon Han (Ph.D. 1995), Chen C. Hsu (Ph.D. 1972), Kak-Choong Kim (Ph.D. 1964), Sung Wan Kim (Ph.D. 1969), Steven M. Kuznicki (Ph.D. 1980), David J. Lentz (Ph.D. 1973), Marilyn Alder Marquis (Ph.D. 1951), Kenneth W. Nelson (M.S. 1957), Bryant W. Rossiter (B.A. 1957), Arthur L. Ruoff (Ph.D. 1955), Hyung K. Shin (Ph.D. 1961), Richard P. Smith (Ph.D. 1951), Doyle C. Udy (B.A. 1943), and Dan W. Urry (Ph.D. 1964) are numbered among the alumni who have been especially generous to the Chemistry Department.

Two true stories will illustrate the adventures of many of our former students. Leonard Wojcik, a graduate student from the 1970's was and is a particularly daring pilot of private, fixed-wing aircraft. In one notable exploit in Alaska he was dropping supplies from his aircraft to other people from the Chemistry Department on the ground who were participating in a climbing expedition. Leonard was the only person on board the plane and was pushing supplies out the door of the plane when the aircraft crashed breaking both of Leonard's legs.



Doug Gordon, a member of Joel Miller's research group, in his element on the Snake River in 1997.

The 1990's saw one of our graduate students, Doug Gordon, killed while participating in a National Geographic Society sponsored kayaking expedition on the Tsangpo River in southeastern Tibet. A book about the ill-fated adventure is soon to be published nationwide. Gordon was a graduate student working toward a Ph.D. in Joel Miller's research group. These two true stories will make the casual reader appreciate that University of Utah

chemists constitute a broader, more adventurous cross-section of the general population than many people would imagine.

The University of Utah Chemistry Department has grown significantly in the last half century and continues to do so. Professor David Grant is now leading an effort to secure funding for new construction that would double the size of the South Wing of the HEB. This facility will be needed to accommodate the growing number of students and faculty in the Chemistry Department. Here's to another half century of groundbreaking research, illustrious faculty members and scientifically gifted students!

## Ph. D. Degrees Awarded 1947 to 2000

<b>2000</b>	<p>BASAME, Solomon Belangedi            BLAGG, Brian Scott Jonathon            GRIFFIN, James Brian            Ji, Quin            KULSOMPHOB, Vichien            LEUNG, Allen Wai-Kwong            PORELLO, Silvia            RADISKY, Evette Sanborn            ROTHSCOPF, Gretchen Katherine            WANG, Yong</p>	<p>BATH, Bradley B.            FAN, Jun            HARPER, James Kimball            JOHNSON, Michael Andrew            LANGENBERG, Jon Douglas            MEYER, Wayne E.            PUGH, Mark Lowell            RITTENBERG, Durrell Kerry            STANLEY FERNANDEZ, Suzanne Marie            WILLIAMS, Scott D</p>
<b>1999</b>	<p>ALVEY, Luke Jonathan            BASIR, Yousef Jamil            CAO, Wen-Jie            GRIER, Mark Charles            LI, Xiang-Yi            MANSON, Jamie L.            OLENYUK, Bogdan Z.            PERSKY, Neal E.            SALAZAR, Michael Ryan            TAYLOR, Craig M. V.            VOGT, Andrew Dale            WANG, Hong            XU, Yaping</p>	<p>AWADA, Mohamad            BELL, Richard Lee            DUNCAN, Wendell Thomas            JARSTFER, Michael Bruce            LI, Zhi            McDOUGAL, Owen Michael            OLSON, Lydia Gayle            RAGSDALE, Steven R.            SHIELD, Stephanie Renee            VAN HORN, Jon David            WAGER, Travis T.            WEIBEL, Michael Andrew</p>
<b>1998</b>	<p>AMANN, Clare Marie            BENDER, John Anthony            BRANDON, Erik J.            BUSCHMANN, Wayne E.            HANSEN, Richard Lloyd            LEE, Hoo-Keun            NOWORYTA, Jerzy Piotr            STARK, Gene Albert            TOMASZEWSKI, Robert            WILLIAMS, John Mark</p>	<p>BELL, Robert L., Jr.            BENNETT, Brian Kieth (sic)            BRUGH, Dale Jason            CAO, Shibai            HATCHETT, David Wayne            MURCH, Paul Erwin            ROBERSON, Mark Jeffrey            STEVENSON, Keith J.            WHITEFORD, Jeffery Alan</p>
<b>1997</b>	<p>ANDERSON, Mark Alan            BHANTHUMNAVIN, Worawan            HAHN, Frederick Mark            KIM, Kristine Mi-Kyeong            LACY, William Bryant            LYON, Vance Andrew            McHARDY, Stanton Furst            MORE, Michelle Birke            PEREZ, Ronelito Josue            TJELTA, Brenda Lynn            WENZLER, Lisa Ann            YI, Eugene C.</p>	<p>BENDERSKII, Alexander V.            CAO, Danh Huu            KAUP, John Gerard            KIPLINGER, Jaqueline Loetsch            LLOYD, Christopher Robert            MASSICK, Steven Michael            MILLER, Michael Eliot            ORR, Edward C.            SHI, Yanlong            WANG, Zhaolin            YEH, Ren-Hwa</p>
<b>1996</b>	<p>ARNOLD, Bradley Ray            CHASE, Charles E.            FISTER, Julius Camilus            GLAESKE, Kevin W.            HAN, Taejoon            HSU, Mao-Lin</p>	<p>CASSIDY, Pamela Denise            FABBI, Jacqueline Carlene Pinegar            FOSSETT, Martin Emerson            GONZALES, Nick O.            HAYNES, Christopher Lee</p>
<b>1996</b>	<p>HUANG, Dahai            KLINGBERG, Detlef            LOOMAN, Steven Donald            NEFEDOVA, Veronika V.            PATRICK, David Lynn            RUSSON, Larry Maynard            SOMMERFELD, David A.            WU, Wenping</p>	<p>IULIUCCI, Robbie James            KRISHNAMURTHY, Dhileepkumar            LOTT, William Berry            OVCHINNIKOV, Mikhail A.            REN, Feiyan            SAVIN, Kenneth A.            TESTER, Richland Wayne            XU, Yuehong</p>
<b>1995</b>	<p>ANDERSON, Karen Lynn            CAMBRON, Robert Thomas            DOCKERY, Kevin            GEE, Richard Hayes            HARKINS, Timothy            KICKEL, Bernice Louise            MARTINS, Laura Jean            SODERQUIST, Arlen            WANG, Haibo</p>	<p>ARRINGTON, Caleb Anthony            CHEN, Yumin            DUH, Der-Ming            GUNAWARDENA, Kushlani            HWANG, Chi-Ching            MANSUETO, Edward Sergio            PALANI, Anandan            TARBET, Kenneth H.            WANG, Yan</p>

1994	<p>WILSON, Anne Marie            BEHM, Jane Marie            BROWN, Russell A.            CALKINS, Trevor Lee            CHEN, Chien-I Peter            FISHER, Peter Virgil            HARRISON, Roger George            JIANG, Yong            LEE, Jeonghee            MURRY, Jerry A.            RABKE, Carol Elizabeth            SU, Chen Xing            TYKWINSKI, Rik            WILLIAMSON, Bobby L.</p>	<p>BOTCHER, Tod Robert            BUFFIN, Brian Patrick            CHEN, Anjun            DALLESKA, Nathan F.            GUNAWARDENA, Gamini Upul            HINKLE, Robert James            LEAVITT, Andrew James            LEVER, David C.            NAIDU, B. Narasimhulu            RANER, Gregory Martin            TARKARNPRUK, Wimonrat            WAITE, Scott William</p>
1993	<p>ANDERSON, Stephen Gee            CRITTELL, Charles Michael            HUANG, Yande            LIU, Guang Yue            TAGUE, Thomas Joseph, Jr.</p>	<p>CHRISTENSEN, Dale J.            FUH, Chwan Bor            HUGHES, Craig Dale            LIU, Min-Kuang            ZHENG, Zhiwen</p>
1992	<p>ANDRUS, Merritt B.            CLEMMER, David E.            EARL, Edward A.            HELLE, Mark A.            HUANG, Yo-Hsin            KOCH, Thomas            LIAN, Li            MAVROMOUSTAKOS, Stylianos            NILES, Stanley R.            PENG, Tang-Sheng            SHERWOOD, Mark H.            SPAIN, Eileen M.            XIA, Jiulin</p>	<p>BISHEA, Gregory A.            DEWEY, Michael A.            HEIDECHE, Scott A.            HERNANDEZ, Ramon            ISAK, Stefan J.            KOURES, Antonios G.            LU, Xiangjun            MOON, Myeong Hee            O'NEIL, James P.            POSS, Mitchell J.            SOUSA, Joao P. D. F.            WENG, Weiqing            ZHONG, Zhandong</p>
1991	<p>ANDERSON, Lawrence Glenn            DUNKEL, Reinhard            FU, Zhenwen            KLOBUS, Michael Andrew            LIU, Fang            QUIROS, Nelson Ivan            SONG, Linsheng            TONNIES, Shawn Marie Dougherty            WALLACE, Ingvar A.            YU, Jaehoon</p>	<p>DALTON, Dennis Michael            FISHER, Ellen Ruth            GEBLER, John Charles            LEE, Kenneth E.            MAUTZ, Douglas S.            RODRIGUEZ, Carmen Lillian            TAYLOR, Hugh Lawrence            WALDMAN, Thomas Edward            WONG, Andrew Lee            ZHANG, Donglu</p>
1990	<p>BENNETT, Robert R.            DASCHBACH, John L.            DIBBLE, Bridget Gourley            HAMRICK, Yoon Mi Lee            LEMIRE, George Wayne            MELENDEZ, Enrique            NEWSOME, Peter Wyatt            PARRY, Diane B.            ROMER, Duane R.            SANDERS, Clifton G.            TAFESH, Ahmed M.            WEAVER, Michael R.</p>	<p>CRESSMAN, Erik N. K.            DAVISSON, Vincent Jo            GEORGIOU, Savas K.            HAWKINS, Marvin Clair            LEOPOLD, Mary Frances            MORRISON, Richard W.            OSTERBERG, Carolyn E.            POSTON, Pete E.            RUSSELL, Andrea E.            SEDLACEK, Arthur J., III            TAYLOR, Scott            ZHU, Xiao-Rong</p>
1989	<p>ABBOTT, Duain E.            FUNK, David John, II            HUANG, Zheng            LEE, Seunggho            SENN, Dwayne Robert</p>	<p>FREEMAN, Jeffrey Willis            GMEINER, William Henry            KENDALL, Ricky A.            O'NEAL, Douglas Wayne            SMITH, Ronald Scott</p>
1988	<p>ASHLEY, Kevin E.            CURTIS, Janet C.            DAVIS, Darrell R.            GEDRIDGE, Robert W.            HOWARD, Stephen L.            KOWALSKI, Mark H.            LEARNED, Alan E.            NEWBOUND, Timothy D.            ORENDT, Anita M.</p>	<p>CARTER, Carl M.            DATTA, Arun K.            DE POY, Rosemarie E.            HANSEN, Marcia E.            JONES, Harlan K.            KRALIK, Michael S.            MERROW, Clifton N.            OBA, Edwin Dean</p>
1988	<p>PEOPLES, H. Allan            SEIDEL, Jimmy L.</p>	<p>RISEMAN, Stephen M.            SETHI, Naresh K.</p>

- STAHL, Lothar  
 TIAN, Rujiang  
 WILEY, Michael R.  
**1987** ADAMIC, Raymond Joseph  
 FOLEY, John Kieran  
 HEESCHEN, William Andrew  
 HIGASHI, John Michael  
 MORIN, Frederick George  
 PHILLIPS, Gregory R.  
 SOLUM, Mark Stephen  
**1986** WOODSIDE, Andrew Bencich  
 BANDYOPADHYAY, Saibal  
 CASSIDY, John Francis  
 CROCCO, Guy L.  
 ENHOLM, Jonathan Eric  
 JANSEN, Kathryn Lynn  
 LLOYD, Barry Alan  
 SNOW, Steven Ashley  
**1985** XIANG, Tian-Xiang  
 BODEN, Eugene Pauling  
 CHRISTENSEN, Stephen B.  
 DAVIS, Joe Matthew  
 KACHENSKY, David F.  
 MCKENNA, William Patrick  
 NEWMARK, Richard Dale  
 OZMENT, Judith Lynn  
**1984** ANDERSON, Gary Harold  
 BRIMHALL, Steven Lyn  
 NELSON, Keith Allen  
 WILSON, David Richard  
**1983** ACEVEDO, Oscar Leobardo  
 COOTS, Robert Jay  
 FOX, Dennis Peter  
 NICKELL, David Glenn  
 WHITE, Mitchell Ray  
**1982** AMARNATH, Kalyani  
 CAVANAUGH, David B.  
 JONES, David S.  
 LEMPert, Walter R.  
 NEAL, Timothy R.  
 WALLACE, Susan L.  
 Yang, Feng-Shyang  
**1981** BLACK, Edward Partridge  
 DOVICH, Norman John  
 LESSLEY, Sim Duane  
 MARSHALL, David Barton  
 NIKOLAI, William Louis, III  
 THOMPSON, Michael Douglas  
 YIM, Yung-Chang  
**1980** FISK, Thomas Eugene  
 GARROSSIAN, Massoud  
 GAUGHAN, Roger Grant  
 KENNEY, John William, III  
 KUZNICKI, Steven Mitchell  
 NEUSTADT, Robert Jules  
 REDINGTON, Patrick Kay  
**1979** BENNETT, Dennis W.  
 LIN, Hao-chou  
 LIVINGSTON, Clyde Lewis  
 SATTERWHITE, Dennis Michael  
**1978** BAREFIELD, James E.  
 CAMAIONI, Donald M.  
 HILEMAN, Frederick D.  
 LEE, Sootae  
**1978** MILES, Douglas L.  
 RENLUND, Anita M.  
**1977** ANDERSEN, Earl L.  
 BOWMAN, Lyle M.  
 LIESEGANG, Gerarld W.  
 NIELSON, Dennis W.  
 STREMLER, Kay E.  
 WANG, Jiang-Hua  
 ZWICK, Bill D.  
 CARR, Jeffrey W.  
 FREY, Regina Faye  
 HELSTROM, Arlee Louise  
 KORZENIEWSKI, Carol  
 MUEHLBACHER, Manfred  
 SCHIMPF, Martin Edward  
 WILLIAMS, Michelle Elizabeth  
 BREWSTER, Gary B.  
 CHEN, Jenn-Sheng  
 DIXIT, Vandana  
 GUNDERSON, Judy Joy  
 JENSEN, James O.  
 SNOW, Sarah Severson  
 TREHAN, Rajender  
 BROWN, Mark Steven  
 CHULJIAN, David Toros  
 FRANS, Stephen David  
 LEACH, Roger A.  
 MITCHELL, Mark Byron  
 OTTESON, Aaron Dale  
 WALLRAFF, Gregory Michael  
 BEELER, Alvin Jeffrey  
 GRIFFEY, Richard Holmes  
 PETERSON, John Rolfe  
 YATES, John Bennie, III  
 CARTER, Christine Anita  
 CYMBALUK, Teddy Henry  
 GRUA, James Russell  
 PELLETIER, Michael Jerome  
 BACIC, Zlatko  
 HEROLD, David A.  
 KELLEY, Robert L.  
 LLOYD, Lindsay Bruce  
 STEWART, James Anderson  
 WEBB, Robert R., II  
 DODDS, Alan R.  
 KNORR, Fritz John  
 MALMIN, Oliver Kim  
 MASH, Eugene Arthur, Jr.  
 SHEPARD, Ronnie Lee  
 WIGGINS, Paul Landry  
 ZILM, Kurt William  
 FRANK, Lenore Randall  
 GAUDIOSO, Larry Alan  
 GREENWALT, Casper Charles  
 KING, Chi-Hsien Richard  
 McHALE, Jeanne Louise  
 OBERLANDER, Joseph Eugene  
 TREPTOW, Warren L.  
 BIALKOWSKI, Stephen Edward  
 LIN, Yn-Hwang  
 ROBINSON, Randall Eugene  
 WHITTENBURG, Scott Laird  
 BOYD, Jack D.  
 HAMIL, William D.  
 KOLLIN, Werner  
 NOBLE, Thomas A.  
 STROEBEL, Gary G.  
 ANDERSON, Albert G.  
 FITZPATRICK, John R.  
 MAYNE, Charles L.  
 SHAW, John H.

	SMITH, Larell K. STEVENS, Don J.	SMITH, Peter P. WILKERSON, John L.
1976	EASTMAN, Alan Dan MANGUM, Michael George NOGAR, Nicholas Steven SANDERS, Edward Henry	HUGES, John Maurice MUMFORD, Neal Alva RYAN, Philip Wallace
1975	DOWNING, John Wayne HARGROVE, Robert John KREMER, Lawrence Nicholas, III ODOM, Robert Wayne	FREDERICK, Gary Donnell KESNER, Laya Floch MYERS, Drewfus Young SMITH, Richard D.
1974	THURBER, Timothy Craig ANDERSON, Richard Bruce CLARK, Roger Thomas DUEBER, Thomas MIN, Tae Bang SPILLNER, Charles J., Jr. WELCH, Melvin Bruce YANG, Frank Jiann-Fu	VESTAL, Marvin Leon BECK, Boyd Reid DEWEY, Harry John HOGAN, Patrick B. SCHMIDT, Charles L. UEHARA, Yosei (Ree) WRIGHT, Randy Ben
1973	ALVAREZ, Vernon Leon ERNST, Stephen Richard GREGONIS, Donald Eugene RHODES, George Wyatt SHIEH, Dean Jau	ANDERSON, Christopher GRAHAM, Richard Charles LENTZ, David John SHAW, James Russell UHLIG, George Franzen CHAN, Yihlin FLETCHER, Richard William HSU, Chen-Chao
1972	BURKE, John David EVERTON, Thomas FLYNN, Charles Robert INSKEEP, Warren Herschel PANZICA, Raymond Philip STREPPER, Richard Dean	MONROE, Manus Bernard SANDBERG, Richard Garth WU, Shuh-Wei CHEONG, Kam-Khow CLOW, Roger Paul FAERBER, Gerald Lee GRABBE, Rolland Ralph JOHNSON, Albert LeRoy LEUTZINGER, Eldon E. LONG, Robert Allen MICHELSON, Christian Edward OWEN, Jeffrey Daniel RYU, Ji-Yong
1971	AUBORN, James John CLARK, Gary James COLLINS, Scott William FU, Juian-Juian Liu HERBELIN, John Morgan KIM, Sang-Hyung LIVINGSTON, Robert Condie LYERLA, James Richard NATHAN, Lawrence Charles PEMBERTON, James Paul STRONG, Arthur Brent	COLE, David LeRoy DUCH, Michael William GHANDEHARI, Mohammad Hossein HINSHAW, Jerald Clyde MacKNIGHT, Allen Kent SHUMAN, Dennis Alan
1970	BOONE, Daniel Reuben CURRIE, Bruce LaMonte FU, Yi-chang HILLS, Lorin Paul KLINGBIEL, Richard Thomas RICH, Larry Dean WITKOWSKI, Joseph Theodore	BENNION, Bruce Carver DALLING, Don Keith HARGIS, James Howard JOHNSON, Wallace Delmar LOVING, Ben Arthur POPP, Carl John SWEAT, Floyd Walter TOLMAN, Richard Lee LU, Wei-chen PAIK, Woon-kie
1969	BABB, Robert Massey BREITLING, Shirl Morgan DARNALL, Karen Rae HOLOVKA, John Michael KIM, Sung Wan McCARTHY, James Ray, Jr. ROUSSEAU, Robert James THOMPSON, Gary Haughton	LYERLA, James Richard NATHAN, Lawrence Charles PEMBERTON, James Paul STRONG, Arthur Brent BOONE, Daniel Reuben CURRIE, Bruce LaMonte FU, Yi-chang HILLS, Lorin Paul KLINGBIEL, Richard Thomas RICH, Larry Dean WITKOWSKI, Joseph Theodore
1968	LIN, Cheng-yu NELSON, John Henry SMITH, Richard Leon	JOHNSON, Albert LeRoy LEUTZINGER, Eldon E. LONG, Robert Allen MICHELSON, Christian Edward OWEN, Jeffrey Daniel RYU, Ji-Yong
1967	ANDERSON, Clyde Lee EL-EZABY, Mohamed Samir GARRARD, Verl Grady MILES, Daniel Warren SONNTAG, Arch Christian	DYER, Daniel Sinclair EL-SAYED, Laila Mohamed Sabet JENSEN, William Denzil PERKINS, Richard Scott VAN LEAR, George Edward BEARD, Howart Richard BROWN, Terry David FULLER, Edward Noel GERIKE, Peter JENSEN, Ronald Paul MILES, Melvin Henry TOU, Chieh
1966	ALGER, Terry Dean BODÉ, Donald denby, Jr. CHENEY, Brigham Vernon GARVEY, Roy George HASLAM, John Lee JHON, Mu Shik PUGMIRE, Ronald Paul	

1965	WHITTAKER, Mack Page CHAPPELL, Gilford Arthur JENNINGS, Paul Wendall LIANG, Kai McLAUGHLIN, Donald Reed MYERS, Marcus Norville WOOLFENDEN, Warner Reynolds	JAMES, Mar Lynn Rees KIANG, Kuo Su Chin LITCHMAN, William Morris MINER, Bryant Albert WANG, Yun-Liang
1964	CHENG, Thomas Tein-sow FUSHIMI, Fred Chikashi KIM, Kak-Choong LIN, Sheng Hsien TEERLINK, Wilford John VAUGHT, David Mitchell	DORRENCE, Samuel Michael HOFF, Raymund Earl LIN, Kingso Shingtsung MA, Shao-mu URRY, Dan Wesley
1963	GOKEN, Gary Lee HOLLAND, Hans Joachim KUHLMANN, Karl Frederick PETERSON, Robert Hampton WELCH, Garth Larry	HIRST, Robert Charles JACKNOW, Joel LE FEBRE, Vernon Glen SCHROEDER, Kermit A.
1962	ANDERSEN, Terrell Neils BISHOP, Jay Lyman FELIX, Walter Dale HIGGINBOTTAM, Harold SCHMIDT, Donald LeRoy	BARFIELD, Michael BOYACK, James Ray HECHT, Harry George PAUL, Edward Gray SEAGER, Spencer Lawrence
1961	BEAN, Roger Marcus JONES, Leon Lloyd REE, Teresa Shinye SHIN, Hyung Kyu	FURSE, Clare Taylor QUISENBERRY, Richard Keith SCHEUPLEIN, Robert John TEREDA, Kazuji CHANG, Seihun
1960	CARLSON, Charles M. EYRING, Edward Marcus STOUT, Mason Gardner WRIGHT, Richard Dorius	FULLER, Evertt Jack TUCKER, Ross Norman
1959	KEANE, John Joseph POTTER, Arnel Dewaine SCHMELTZ, Irwin	MORTENSEN, Earl Miller ROBERTSON, Donald Edwin
1958	HAHN, Sang Joon MORREY, John R. WACKS, Mort on Edward	JOHNSON, Robert Le STEWART, George Hudson
1957	BARTON, Bruce Arlyn FUNK, Albert Gail HAMMER, Charles Rankin McGEE, Lloyd Ross RUETMAN, Sven Helmuth SHORT, Glen Allison SPENCE, Jack Taylor TICHY, Jerome R. YUEN, George Ulysses	BOWMAN, Carlos Morales GRANT, David Morris KELLER, Roy Alan ROSSITER, Bryant William  SNOW, Richard Lewis TENSMEYER, Lowell George YANG, Kang ZWAHLEN, Kenneth Dean
1956	BLYHOLDER, George Donald PERKINS, Ralph Hulet	FOSS, John Gerald PETERSEN, Joseph Claire BULLOUGH, Vaughn Lynn
1955	BINFORD, Jesse Stone, Jr. GEE, Kenneth Herbert KRAUSS, Morris MORTENSON, Edna Linnea SORENSEN, David Perry	KATO, Haruto P. McCULLOUGH, Thomas Francis RUOFF, Arthur Louis
1954	DAVIS, Robert Elliott KROPF, Allen McFADDEN, William Hamilton WILHELMSSEN, Paul Chadwick	GIDDINGS, J. Calvin MARCUS, Rudolph Julius WALKER, Franklin Earl ZOLLINGER, Joseph LeMar
1953	GARDNER, Pete Delos HAMMER, George Nelson SHULL, Charles Morell WAYRYNEN, Robert Ellis	GILMOUR, Hugh Stewart RICE, George Basil, Jr. THOMPSON, Grant WILDE, Kenneth Alfred
1952	ANDERSEN, Wilford Hoyt LASATER, James Arthur NIMER, Edward Lee STEPHENS, C. Wayne	JOHNSON, Henry Wilson NEWMAN, Stanley Ray ROSENSTOCK, Henry Meyer
1951	ALDER, Marilyn Grace COLBURN, Charles Buford MUELLER, Charles Richard REYNOLDS, Richard Johnson WALLENSTEIN, Merril Bernard	CHEN, Mei Chio MARKER, Leon PARTRIDGE, William Schaubel SMITH, Richard Pearson

**1950** BORROWMAN, Samuel Ralph  
KWOH, Ting-Chang  
ROSSMASSLER, Stephen Atwater  
**1949** FERRIS, Robert Clarke  
REESE, Cecil Everett  
**1948** HALL, Howard Tracy  
**1947** SUGIHARA, James Masanobu

KOLBEZEN, Martin Joseph  
RAVVE, Abraham  
WEATHERBEE, Carl  
GILMORE, Richard Clyde