MINNESOTA CHEMISTS NEWSLETTER

Department of Chemistry
UNIVERSITY OF MINNESOTA

Fall 1992

A Letter from the Chair

W. Ronald Gentry

Ah—September! As the leaves turn color and wild geese form V's pointing south in the sky, the campus rouses from the relative quiet of summer and swarms with the frenetic activity of the beginning school year. The atmosphere is charged with anticipation—and not a little anxiety—as thousands of new students find their ways to classrooms and laboratories. The lobbies of Smith and Kolthoff Halls sparkle with human energy and purpose, much like airport lobbies just before a holiday. This is the season of renewal for the university community—somewhat ironically, since it occurs in the fall of the year instead of the spring. Nevertheless, and despite the impending cold and stillness of a Minnesota winter, this is the time of the year when students, staff and faculty experience most keenly the warmth and excitement of new faces, new ideas and new challenges.

This year we have special reasons to reflect on the annual cycle of campus life. Through the tragic loss last year of two of our most active and distinguished faculty members, Peggy Etter and Ed Leete (see "Transition State"), we are reminded of the uncertainties which affect the lives of both individuals and institutions. At the same time we grieve these losses both personally and professionally, we recommit ourselves to maintaining the strength and vitality of the institution, and we look to the four new faculty members who joined our department this fall with pride and the anticipation of great things to come.

We are also reminded through persistently gloomy economic news that the university, like all public institutions, is under severe financial pressures. While we continue to compete very effectively for external support such as research grants, state support of the university has now fallen below 30% of the total budget for the first time. However, even though overall enrollments at the university have dropped and tuition costs have been escalating sharply, chemistry enrollments continue to grow at both the undergraduate and graduate levels. Perhaps the best single indicator of the future growth of our department is the fact that general chemistry enrollments are up more than 30% from last year. This seems to be a result both of an increase in chemistry requirements for Institute of Technology programs, and increased numbers of College of Liberal Arts students going into health-related programs.

Numbers aside, the vitality of our chemistry program at the University of Minnesota was again reaffirmed for me personally when I walked into my first general chemistry lecture this fall—to face an overflow class filling all the seats and part of the aisles in 100 Smith Hall. As the class fell silent at the sound of the bell, and as I looked into the sea of bright young faces with notebooks open and pencils poised, I felt that peculiar combination of excitement, anticipation, and fear which chemistry students and instructors always share at the start of a new term. Once again I searched for the right images, examples and metaphors to convey my sense of the beauty and power of chemistry to a somewhat skeptical and all-too-easily intimidated audience. I moved on to my first "real chemistry" demonstration, and was rewarded with the chorus of "ooohs" which intense heat, light, and color always draw from the class.

It felt good. The effectiveness of the demonstration had been enormously enhanced because of our new video camera and projection system, which had enabled every student in the class to see it up close. At some

(Letter to page 3)

Graduate Student Research Profiles

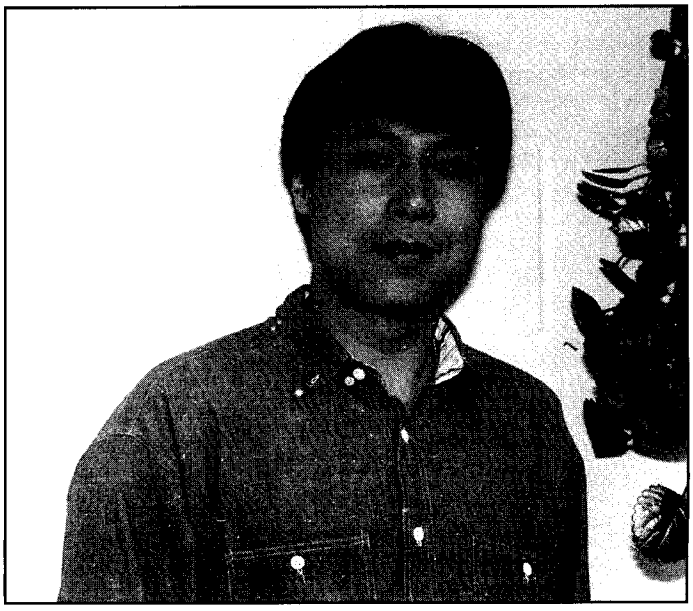
More than one well-known chemist has been heard to remark that "the way to become famous is to work with talented students," and anyone who has spent time in an academic setting will immediately recognize the truth in this assertion. Bright, energetic students are the lifeblood of university laboratories, and resonant interaction with advisors can often stimulate creativity and productivity which exceeds that of either individual. Thus, in this issue of the newsletter, we present the following graduate student research profiles, featuring the accomplishments of graduate students in the department and reporting a portion of their ongoing research. We have asked a selected number of our more senior students to provide us with a few paragraphs about their research, their experiences here, and their future plans. We hope you will find the science exciting and the perspectives refreshing. Some of you might even find that the fruits of your own thesis work several years ago has turned into current graduate student research in the department!

Kim-Hung Chow

In the first decade of this century, my grandfather came to the United States from China as a student. He earned both Bachelors and Masters degrees in mechanical and naval engineering from MIT. His expertise and knowledge about the United States were greatly appreciated during his professional life, both in China and later in Hong Kong.

I was born in Shanghai and later moved to Hong Kong. In 1984, I was accepted by Macalester College and came to Minnesota. Three and half years of my college life were busy yet very rewarding. I graduated from Macalester College with a B.A. in chemistry along with a Phi Beta Kappa key.

(Students to page 7)



Kim Hung Chow

Professor Donald G. Truhlar and a User-Accessible Theory of Reaction Rates

If you can visualize, in detail, all of the quantum mechanical paths by which a chemical reaction can occur, and their relative importance, in principle you should be able to calculate the reaction rate, and all related quantities. These would include the effect of temperature, pressure, partial pressures (concentrations), and isotopic substitution. Comparison with experiment would then test the validity of the original picture, which could be modified to achieve agreement. Empiricists need not fear, however. This grail is in sight only for the dilute gas-phase reaction of hydrogen atoms with hydrogen molecules:

$$H^{\bullet} + H_2 \rightarrow H^{\bullet}H + H$$

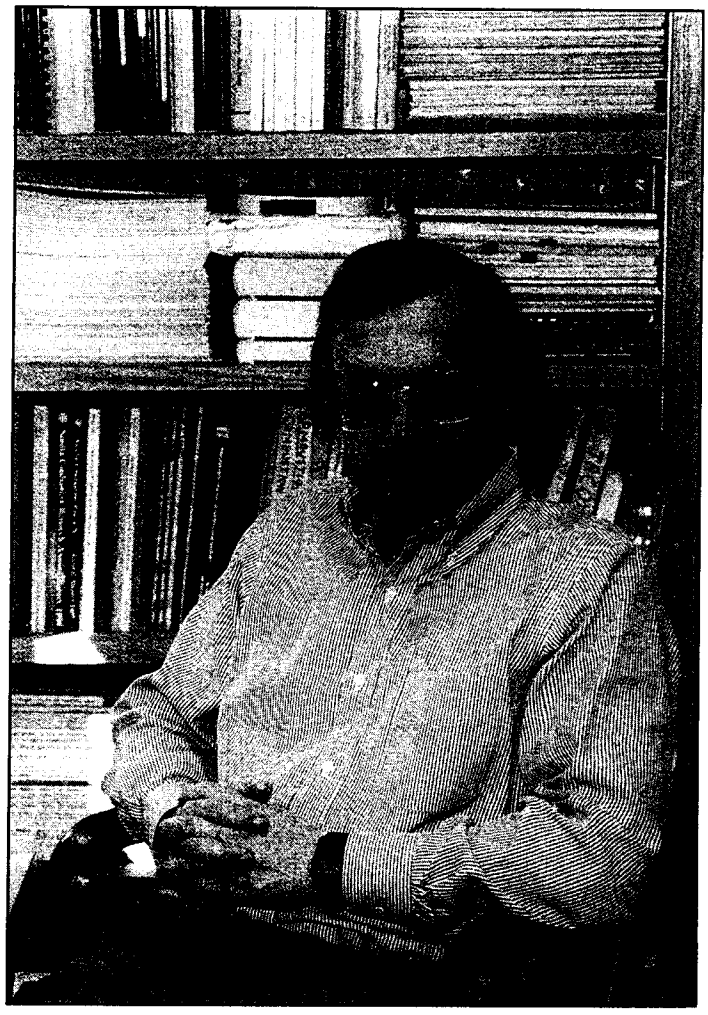
For real-world chemical reactions, even finding the minimum energy path from reactants to products with reasonable confidence by calculation is very laborious in the best cases, and is approached only for a few, simple reactions. More complex processes will provide research problems for future generations of theoretical chemists. For here and now, Professor **Donald G. Truhlar** and his students are filling the gap with approximate theory which is simple enough to be useful, but accurate enough to be reliable.

Truhlar's work builds on the transition state theory of reaction rates, which he improves and implements. The fundamental assertion of this theory is that "There is ... always some intermediate configuration which is critical ... in the sense that if this system is attained there is a high probability that the reaction will continue to completion." (Glasstone, Laidler, and Eyring; *Theory of Rate Processes*: 1941, page 10.) The critical intermediate configuration originally chosen was the point of maximum potential energy on the path of minimum potential energy from reactants to products. The structure corresponding to this point is called a transition state, from which the theory gets its name. Truhlar has shown that considerably more reliable results can be obtained by defining the transition state as the structure of maximum *Gibbs free energy* on the minimum energy path from reactants to products. In comparison with the ideal methods described at the beginning of this outline, all variants of transition state theory have the large advantage that they only require structure/potential energy relations for structures in the neighborhood of the reactants and in the neighborhood of the transition state. This reduces the problem of calculating or estimating such relations to more hopeful proportions.

Truhlar's version of the theory, called variational transition state theory, has the advantage over the original transition state theory that it seems to give more reliable estimates of such rate-related quantities as kinetic isotope effects and the effects of small structural changes on rates. This is important, because most theoretical calculations of this sort are not done to replace measurement. They are done to *understand* experimental results. A model can be compared with the real world by comparing calculated rate-related quantities to experimental values. Comparisons involving kinetic isotope effects and structural variations are often especially useful because of the widespread availability of this kind of data.

Current work in Truhlar's group takes a number of directions. Very accurate quantum mechanical calculations of rates of very simple reactions are being carried out in order to provide further tests of transition state theory. At the same time approximate methods are being used to calculate transition state structures and potential energy surfaces for very large systems. It is particularly important to be able to calculate such surfaces for reactions in solutions and for molecules attached to surfaces, because those are the environments in which most important real-world reactions take place. Recent work has included calculations of the rate and isotope effects for the prototype nucleophilic displacement reaction, $^{\bullet}Cl^{-} + CH_3Cl \rightarrow CH_3{}^{\bullet}Cl + Cl^{-}$ in the presence of up to two water molecules. Hydride transfer reactions in coenzyme analogs have been calculated in collaboration with professor **Maurice M. Kreevoy**. Also, the free energies of solution in liquid water of a large number of organic molecules of various types have been successfully calculated, in collaboration with new faculty member assistant professor **Christopher J. Cramer**. Combining the techniques used in these projects should allow the study of many types of reactions in aqueous solution.

Variational transition state theory has been implemented by a series of computer programs called POLYRATE. These programs have been made available to the scientific community through program libraries. While using them is not a trivial exercise, it is possible for serious experimentalists to master them. They are now being used by a number of other research groups within and outside of the University of Minnesota. The intensive application of high-speed computers has been essential for this work, having made extensive use of the University of Minnesota Supercomputer Institute (for which Truhlar has also been an effective director for several years). With computational power and conceptual framework continuing to expand, we can all look forward to an ever increasing understanding of the fundamentals of chemical reaction rates, upon which so much of chemistry depends.



Don Truhlar

National Conference on Undergraduate Research Held at the University of Minnesota

Regents' professor **Paul Gassman** served as co-chair, with professor **Frank Barnwell** of the Department of Ecology, Evolution and Behavior, for the 6th National Conference on Undergraduate Research (NCUR), which was held on the Minneapolis campus of the University of Minnesota on March 26-28, 1992. Over 1,700 undergraduates and their faculty advisors participated.

During the 40 poster sessions, over 1,200 students presented their research in 18 major disciplines. These young, bright scholars represented 250 colleges and universities from 49 of the 50 states and Puerto Rico. Approximately 220 of their presentations were in chemistry and biochemistry.

Plenary speakers for the 6th NCUR included Dominick Argento, one of America's leading composers and the most frequently performed 20th century composer at the Minnesota Opera; Mary Lowe Good, Senior Vice President for Technology at Allied Signal, Inc., and chair of the National Science Board; Daniel Janzen, Professor of Biology at the University of Pennsylvania; Jerrold Meinwald, Goldwin Smith Professor of Chemistry at Cornell University; and Charles V. Willie, a sociologist and Professor of Education and Urban Studies at the Graduate School of Education at Harvard University.

The mission of the NCUR is to promote undergraduate research, scholarship and creative activity done in partnership with faculty or other mentors as a vital component of American higher education. Established in 1987, NCUR is an association of college and university faculty, students and administrators, and others interested in the mission in all fields of study. NCUR seeks to enrich undergraduate teaching and learning by promoting opportunities for students to experience firsthand the processes of scholarly exploration and discovery that characterize the academic life, to assist the professional efforts of faculty and others in these areas, and to understand and appreciate the goals, methods, and results of diverse areas of inquiry and ways of knowing. Through its annual conference, NCUR creates a unique environment for the celebration and promotion of undergraduate student achievement, provides models of exemplary research and scholarship, and fosters the improvement of undergraduate education.

Sponsors for this enormously successful conference include the Council for Undergraduate Research, Camille and Henry Dreyfus Foundation, Department of Energy, Ecolab, General Electric Foundation, Medtronic, Merck Company Foundation, Monsanto, National Collegiate Honors Council, National Science Foundation, Phi Beta Kappa, Research Corporation, Sigma Xi, and 3M Company.

Message from the Editors

George Barany and Ken Leopold

As noted by our Chair in his letter, the fall is a curious time of the year, especially in Minnesota. There is a certain excitement which comes with the yearly influx of new faces and the anticipation of a new academic year. At the same time, each summer seems to have been shorter than the previous one, and we are left wondering what happened to the past three months. Perhaps it is this combination of looking forward and backward that makes this a particularly appropriate time to re-establish our contact with friends and former students, many of whom joined us in the days when summers were long and the Twins were not serious pennant contenders. So once again we have assembled what in our view represents the highlights of the past year in the Department of Chemistry, and pass them along to you. We hope this issue provides you with some combination of enjoyable reminiscence and anticipation of things to come.

Each year we try to feature some aspect or sector of the Department of whose contributions we are particularly proud. In the past, for example, we have highlighted our civil service staff. In our most recent issue, we concentrated on activities related to our undergraduate students. Another regular feature has been the traditional faculty "Research Profiles." This year, we have chosen to recognize the critical role that *graduate students* play in maintaining the vitality and productivity of chemistry at the University of Minnesota. To do so, we have selected several of our most outstanding senior graduate students across a variety of disciplines, and asked them to provide us with a glimpse of both their research, and of themselves. Many are nearing the completion of highly successful graduate careers, and represent, in our opinion, an integral part of what makes this department tick.

We thank these students for their first-person accounts. Our indebtedness extends to the many members of the department who made notable contributions to this year's data gathering and writing. We particularly thank **Joel Bernstein**, **Bryce Crawford**, **Bill Gleason**, **Paul Gassman**, **Maurice Kreevoy**, **Wayland Noland**, **Don Truhlar**, **Stephanie Miller**, **Sue Page**, and **Melissa Sirek**. The fine photography is the labor of love of **Dale Randall**, for which we are most grateful. **Kathy Ross** notes that this year's edition marks the fifth issue for which she has been assistant, and wants our readers to know that her reward will be the interesting accounts of alumni activities which she will eagerly compile from your many contributions!

(Letter from page 1)

point, the interest and imagination of a student may have been stimulated enough to begin a lifelong appreciation of the role which chemistry plays in our lives, or even to start the student on a path toward a career in chemistry or a related field. That is the core of our educational mission, and it feels wonderful when you can see progress reflected in faces throughout the classroom.

As always, the continued support of our friends and alumni is vital as we strive each year to improve both the quality and quantity of the education we offer our students at all levels.

Transition State

PROMOTIONS

Steven Kass was promoted from assistant professor to associate professor with tenure. Steve joined the faculty of chemistry in the fall of 1986, directly from a postdoctoral position at the University of Colorado, Boulder, with C. H. Depuy and G. B. Ellison. His undergraduate degree was from Vasaar College, and his Ph.D. was earned in 1984, under the direction of Kenneth Wiberg of Yale University.

Steve's research interests are in the study of gas phase ion-molecule chemistry. Using a combination of synthetic techniques and a variable temperature flowing afterglow reactor, a wide variety of novel, highly reactive species can be produced, and their intrinsic reactivity and thermodynamic properties probed.

Kenneth Leopold was promoted from assistant professor to associate professor with tenure. Ken came to Minnesota in the fall of 1986, after completing a postdoctoral appointment with K. M. Evenson at the National Bureau of Standards in Boulder, Colorado. His 1983 Ph.D. work on the molecular beam microwave spectra of weakly bound molecular complexes was completed with W. Klemperer at Harvard University, following undergraduate study at the State University of New York at Stony Brook.

Ken's research involves chemical applications of high resolution molecular spectroscopy. In particular, he and his students are currently using far infrared and microwave spectroscopy to study van der Waals and hydrogen bonded interactions, as well as molecules with only partially developed chemical bonds.

NEW FACULTY

Several new faculty have joined the department this fall as a result of a very successful recruiting season. We take this opportunity to welcome them aboard and wish them every success as they embark upon their academic careers.

Christopher Cramer received the Ph.D. in Chemistry in 1988 with S. E. Denmark at the University of Illinois at Urbana-Champaign. His undergraduate degree is from Washington University in St. Louis, and prior to joining us he completed postdoctoral work with the U. S. Army Chemical Research, Development, and Engineering Center. During the latter appointment, he collaborated extensively with Professor **Donald Truhlar** of this department. He also saw active duty in Operation Desert Storm, and is one of the very few American chemists to have recently spent time in the Euphrates river valley and to have seen the Kuwait oil fires up close and personal.

Chris's scientific interests revolve around the development and application of theoretical (computational) models for the study of organic, bio-organic and inorganic processes. This includes studies on quantum chemical methodologies for modeling chemistry in aqueous solutions, and probing putative pathways for the biodegradation of organophosphorus species.

Mark Distefano was a double major in chemistry and biochemistry at the University of California at Berkeley, and moved to MIT for his 1989 Ph.D work under the direction of Chris Walsh, where he studied enzyme reaction mechanisms. He joins us directly from a postdoctoral appointment in nucleic acid chemistry with Peter Dervan at the California Institute of Technology.

At Minnesota, Mark plans to work on protein engineering, and study mechanisms of oncogene modification and protein catalysis of RNA reactions. Mark enjoys a variety of activities including backpacking, skiing, and music. Before coming to Minnesota this fall, Mark spent time treking in the Everest region of the Himalayas in southeastern Nepal.

Craig Forsyth received his Ph.D. in 1989 from Cornell University. His postdoctoral work was with Yoshito Kishi at Harvard University, while his undergraduate degree was granted by Humboldt State University at Arcata, California.

Craig's research interests span synthetic organic and natural products chemistry. He received his doctorate in Jon Clardy's group at Cornell University where he was involved in the collection, isolation, and total synthesis of marine natural products. This included several scuba expeditions to the Caribbean to collect marine specimens at depths of up to 100 feet in shark-infested waters. Craig went on to further his synthetic chemistry training as a post-doctoral fellow in Professor Kishi's laboratory at Harvard University, where he recently completed several total syntheses in another class of marine natural products, the halichondrins (compounds with 32 chiral centers and MW ~1100). His research at Minnesota will continue to focus on the development and utilization of synthetic organic chemistry for the study of biologically active natural products.

Karin Musier-Forsyth received her undergraduate degree from Eckerd College in St. Petersburg, Florida, and her Ph.D. from Cornell University in 1989. She comes to us from a postdoctoral position with Paul Schimmel at MIT. Karin spent 18 years living in Florida surrounded by beaches and a constant supply of sunshine. As a biological chemist who realizes the damaging effect of all those UV-rays, however, she believes that living in a northern climate will be much better for her health. Formerly a swimmer and gymnast, Karin hopes to pick up figure skating in her limited time outside the lab.

Karin's research involves the use of chemical, physical and biological techniques to study molecular recognition and structure-function relationships between proteins and nucleic acids in biological systems. The specific aims are to gain a better understanding at the molecular level of how aminoacyl-tRNA synthetases and reverse transcriptases interact with ribonucleic acids (tRNAs, in particular), and to investigate the structure and function of novel RNA enzymes or "ribozymes."

RETIREMENTS

Mary Jane Lewis, a native Minnesotan who was born, raised and educated in Duluth, retired in January, 1992. She graduated from Cathedral High School in 1946, and worked as a secretary with Snyder's Drug and J. H. Larson Electric before joining the University. Mary Jane came to the Department of Chemistry in May of 1974 as a senior secretary. Over the years, she and the job grew together as she assumed additional responsibilities in the department's general chemistry program. Her job was reclassified to principal secretary in December of 1976, and then to executive secretary in May, 1979, the position she held at the time of her retirement.

Every quarter, about 1500 students take general chemistry. Almost every one of these have at some point made his or her way into Mary Jane's office, which had a campus-wide reputation for warmth, friendliness and efficiency. Often they would stop by to say thanks, or just hello after they completed their program. In addition to her duties in that program, she also served three terms on the University's Civil Service Grievance Review Board, and organized a civil service association in the department. She served as president of the latter group for three years, and wrote and published a monthly newsletter for chemistry staff. Her dedication to the department and to the Institute of Technology was recognized by the presentation of a 1988-89 IT Civil Service Outstanding Service Award.

Mary Jane has been active in many outside organizations as well, holding offices in most of them. She served as president of the Mirror Lake Condominium Owners' Association and the Immaculate Conception Mother's Club, and has been a eucharistic minister and lector in the

Immaculate Conception Catholic Church. She has also been active in the Democratic Party. Her hobbies include reading, writing, and playing cards. She and her husband Jim, a retired design engineer, have been married for over 45 years and have three children and many grand- and great-grandchildren. Mary Jane will continue her many activities, and together, she and Jim will enjoy their cabin in northern Minnesota. Her colleagues and friends in the Department of Chemistry wish them many long and productive years.

By the time this reaches you, the department will be working out its adjustment to a major change, which occurred just after the end of the academic year. On August 16, 1992, **Gladys M. Olson** actually carried out her oft-made threat to leave us, and ended her long membership in our department. No longer will she be here to guide incoming secretaries, to welcome incoming students and to counsel those preparing for departure, to assist friendly talent recruiters from our corporate industrial colleagues, and in general to help faculty and students and all members and friends of the department in coping with our various confusing folkways.

The record shows some forty-one years with the department, with titles ascending from senior secretary through associate administrator. Gladys presided over the front office as the formalities of the administration changed from a director of a school to a dean and then a head of the department, and finally settled (at least for now) on the designation of chair. Every chair of our department has been aided, and often guided, by Gladys.

In her modest way, Gladys would allow no proper celebration at the time of her retirement; a few of her friends in the department did manage a small gathering on August 12 (permission for which was not lightly given) to toast with her in recollection of many joint memories. We have assurance that she will not wholly desert us but will keep in touch. Those of you who remember her (and there will be many) may safely send her a note addressed to her simply C/o the department. An appreciation purse is also growing; if you would like to contribute, a check made out to Ron Gentry will be properly included therein.

The character of any department grows out of the individual people who make up that unit, and their interrelations and common understanding of and dedication to its purpose. Our department has had many major contributors to its development and its strength. We are grateful to Gladys Olson for her long participation in our growth; we shall miss her as we strive to continue the development and constant improvement to which she gave her fine effort.

DEATHS

It is with great sadness that we report the loss of two beloved faculty members to cancer since our last newsletter. Each struggled against the odds in admirable fashion, and leave significant voids in the fabric of this department.

Margaret Cairns Etter was born on September 12, 1943, and passed away on June 10, 1992 after a brave struggle against cancer. Peggy, as she was known to everyone, had deep roots in the local chemical community. She received her Ph.D. in chemistry from the University of Minnesota in 1974 under the direction of Jack Gougoutas, taught organic chemistry at Augsburg College in 1975 and 1976, and worked at 3M Company from 1976 to 1983. Peggy returned to our department as a postdoctoral fellow with Bob Bryant in 1984, and within a year secured an independent academic appointment. Peggy then rose rapidly through the ranks, from assistant professor (1984–1988) to associate professor (1988–1990) to full professor (1990 on). In the 1989-90 academic year, she served as vice chair of the department. Prior to her graduate work, Peggy was a Phi Beta Kappa graduate of the University of Pennsylvania and received a master's degree in chemistry from the University of Delaware.

At 3M, Peggy established a solid-state chemistry group and X-ray crystallography laboratory, and was involved in projects ranging from polymer chemistry to hydrogen-bonding in organic solids. She helped to establish the 3M Visiting Women Scientists program, which aimed to encourage female students to consider science as a career. Peggy was a director and instructor in the company's STEP program for minority high school students.

Peggy was also active in the American Crystallographic Association. She served as chair of the small molecule special interest group, edited a volume of the Tran*sactions of the American Crystallographic Association*, was the program chair for the 1991 national meeting, and had organized a special session on chiral recognition for the 1992 national meeting. She lectured widely and gave seminars in Japan, Britain, France, and Israel. Peggy's last lecture series was given in Israel in February of 1992, when she had the opportunity to visit her long-time collaborator, Professor Joel Bernstein, who had worked in her laboratory at 3M and at the University of Minnesota while on sabbatical.

Peggy's outstanding characteristics as a scientist were her infectious enthusiasm, uncompromising scientific standards, and high creativity. She was genuinely excited about solid-state chemistry and wanted to share this with coworkers and students. During an all-too-brief but sparkling period of seven years, the Etter group made major contributions in the applications of solid-state NMR spectroscopy, the design and properties of organic non-linear optical materials, and perhaps most significantly, in the understanding and utilization of hydrogen-bonding interactions in crystals. This was reflected in nearly 80 original research papers, and in several landmark invited review articles in prestigious journals. Outside recognition in the form of fellowships from the Sloan and Bush Foundations and an Iota Sigma Pi Award for Excellence in Chemistry represent an incomplete reflection of the impact of this work. One of her extramural "side projects" was to found a company called "Rochelle Crystal Corporation," for which Peggy was named St. Paul Businessperson of the Year in 1986.

Everyone who came in touch with Peggy treasures special memories of her warmth, humor, and humanity. Her office walls contained photos of coworkers and colleagues, prints by M. C. Escher (another person fascinated by symmetry, who coincidentally had the same initials), and Gopher sports posters. Students and colleagues from throughout the department were always made to feel welcome in Peggy's office, to share their frustrations as well as their joyous moments. The outpouring of love for Peggy during her illness may have mitigated some of the tragedy and pain.

Peggy is survived by her husband, William Etter, and children Michael Latimore and Karen Etter. Her family has established a scholarship fund as a memorial at her children's school, St. Paul Academy. In addition, the department has announced the Margaret C. Etter Memorial Lectureship in Materials Chemistry, and is currently working to provide a permanent endowment for this lectureship. Donations should be sent to the University of Minnesota Foundation, 1300 South 2nd Street, Minneapolis, MN 55455.

Edward Leete was born on April 18, 1928, in Leeds, England. At the University of Leeds, he received a B.Sc. in 1948 in color chemistry with 1st class honors and a Ph.D. in 1950. His graduate work, with William Bradley, was on the organic chemistry of colors and dyestuffs. Ed then received a two-year Goldsmiths Company Traveling Fellowship, which he spent with Leo Marion, a well-known French-Canadian alkaloid chemist, at the National Research Council in Ottawa. He continued with Leo Marion until 1954, as a National Research Council of Canada Postdoctorate Fellow.

Leete's work was on alkaloids, which are complex nitrogen-containing compounds produced by plants, partly as a defense mechanism. This work also led to important early studies on the chemistry of indole; Ed's

(Transition to page 6)

American Academy of Arts and Sciences

Regents' professor **Paul Gassman** was elected a Fellow of the American Academy of Arts and Sciences on April 8, 1992. Founded in 1780, the Academy is a learned society with a dual function: to honor achievement in science, scholarship, the arts and public affairs, and to conduct a varied program of studies that reflect the interest of its members and are responsive to the needs and problems of society and of the intellectual community. Other faculty of the Chemistry Department who are members of the academy are emeritus professors **I. M. Kolthoff** and **Bryce L. Crawford, Jr**.

The founding of the American Academy of Arts and Sciences in 1780 by a small group of scholar-patriots led by John Adams was a singular act of faith and foresight. The revolutionary war had not ended, yet the founders of the academy looked to the future, anticipating the need of a young republic for new knowledge and ideas. The charter they adopted was both visionary and pragmatic, reflecting the aspirations of a new nation: *"to cultivate every art and science which may to tend to advance the interest, honor, dignity and happiness of a free, independent and virtuous people."*

For more than two centuries, the academy has sustained this high purpose with an evolving sense of mission matched by few institutions worldwide, and, as a result, has engaged the finest minds in each succeeding generation. The original incorporators, among them John Hancock and Samuel Adams, were later joined by Benjamin Franklin, George Washington, Thomas Jefferson, Charles Bulfinch, Alexander Hamilton, and John Quincy Adams. During the 19th century, the elected membership included Daniel Webster, Henry Wadsworth Longfellow, John J. Audobon, Louis Agassiz, Asa Gray, Ralph Waldo Emerson, and Alexander Graham Bell.

In the early decades of this century, membership in the academy continued to grow as other noted scholars, distinguished scientists, and statesmen were elected. These included A. A. Michelson, Percival Lowell, Alexander Agassiz, and later Charles Steinmetz, Charles Evans Hughes, Samuel Eliot Morison, Henry Lee Higginson, Woodrow Wilson, William Howard Taft, and Henry Cabot Lodge.

From the beginning, the academy has extended honorary membership to distinguished scientists, artists, and statesmen from abroad. Some notable foreign members have been Thomas Carlyle, John Stuart Mill, William Gladstone, John Singleton Copley, Alfred Lord Tennyson, and–in the 20th century–Niels Bohr, Winston Churchill, Jawaharlal Nehru, and Albert Schweitzer. Recent honorary members from abroad include Claude Levi-Strauss, Isaiah Berlin, Samuel Beckett, and Andrei Sakharov.

Today, the academy has 3,000 fellows and 500 foreign honorary members, all of them elected by their peers in recognition of distinguished achievement.

(Transition from page 5)

paper with Leo Marion in 1953 on the hydrogenolysis of 3-hydroxymethylindole with lithium aluminum hydride has been widely quoted. Work on alkaloids became Ed's career choice, and he followed a very consistent theme: answering the question "How do plants take the materials available to them, usually amino acids, and put them together in such complex and variable structures as the alkaloids are?" This, "the biogenesis of alkaloids," he pursued with all the means available to him, including following the pathways by tracer analysis, both radioactive and non-radioactive, more recently combined with nuclear magnetic resonance spectroscopy.

In 1954, Ed began his academic career as an instructor and later assistant professor at the University of California at Los Angeles. In 1958 we were fortunate at Minnesota to hire Ed as a young and promising natural products chemist. He fulfilled that promise. He rose rapidly through the academic ranks, from assistant professor to associate professor in 1960 and full professor in 1963. He had 225 scientific publications, either published or currently in press. He received a number of academic honors, including an Alfred P. Sloan Foundation Fellowship in 1962, a Guggenheim Fellowship at Oxford in 1965, a D.Sc. degree from the University of Leeds in 1965, the Minnesota Award in 1990, which is the highest award, given every three years, by the Minnesota section of the American Chemical Society, and the first Phytochemistry Prize and Medal, which was awarded to him in 1990.

Even though he had numerous graduate, postdoctoral, and undergraduate research students working with him, Ed continued to work in the laboratory himself because he loved it. He also had a flair for acting, which he integrated into his teaching and other professional activities. Ed liked to give demonstrations of experiments to illustrate his lectures, and his popularity was recognized by receipt in 1976 of the College of Liberal Arts Distinguished Teaching Award. Each year the organic chemistry faculty hosted a banquet, the "490 Banquet," for the graduate students. It became a tradition, though not necessarily appreciated by the other faculty, for Ed to demonstrate his adeptness at the technique of blowing fire at the banquet.

Ed loved to travel to scientific meetings in far away places and to take his wife Sheila and their children with them. As a juvenile diabetic, Ed probably compensated by being a physical fitness buff. He was an accomplished runner and ran in seven marathons, including the Twin Cities. Ed had the curiosity and naiveté of an outstanding scientist and artist, where every observation and discovery is a new delight. He had a joie de vivre which was contagious. He was spunky and courageous to the end, which came on February 8, 1992, at the age of 63.

Ed is survived by his wife, Sheila, and children, Peter, Allison, Jennifer, Caroline, Lorraine, Michael, and Nicholas. The Division of Organic Chemistry of the American Chemical Society has voted to establish a divisional award entitled the "Edward Leete Award in Education in Organic Chemistry." Tax deductible donations toward the establishment of this award should be sent to Professor William R. Roush, Secretary-Treasurer, ACS Division of Organic Chemistry, c/o Department of Chemistry, Indiana University, Bloomington, IN 47405, and should indicate that they are for the "Edward Leete Award" endowment.

(Students from page 1)

My first experience with the chemistry department at the University of Minnesota was in the summer of 1987 when I was a Lando fellow working with Professor Kreevoy. The strength and the quality of research in the department impressed me. In the following year, I became a graduate student of the department and joined Professor Kreevoy's group. I am currently pursuing a Ph.D. degree in physical chemistry.

Under the guidance of Professor Kreevoy my research work includes two areas. I studied the extraction of Fe(III) from aqueous solution using solid-supported liquid membranes. Such systems have many potential applications in the medical field and in various industries. The extractants used in the study are dialkyl phosphates. The aqueous-organic interface has been identified as the reaction site. I developed a method to estimate the degree of ionization of the phosphates at the interface using contact angle measurements.

Following the completion of this work, I moved to another research area: a study of hydride transfer between NAD^+ analogues with the aid of computers. Hydride transfer is an important aspect in enzymology. The hydride transfer between NAD^+ analogues, $NAD_i^+ + NAD_jH \rightarrow NAD_iH + NAD_j^+$, provides a useful model for such study. A 3-atom model, $A_i^+ + A_jH \rightarrow A_iH + A_j^+$, was previously developed with success in mimicking the results of a large body of experimental data. I am working on the computational modeling of the effect of ion pairing on the rate constants of hydride transfer between NAD^+ analogues by adding I^- to the cationic 3-atom system. Variational transition state theory and large-curvature semiclassical tunneling approximations are used with a family of analytical global potential energy surfaces. Since ionic interactions are mainly governed by Coulomb's law, the additional terms in the potential functions are simple. The computational results will be compared with rate constants and kinetic isotope effects summarized by the Marcus theory of atom transfer. We also plan to study the effect of solvent on the reaction by introducing discrete solvent molecules in the same system.

My career objective is to work in the chemical or pharmaceutical industry as a computational chemist doing modeling and simulation of chemical and biomolecular systems and reactions.

Tom Clausen at his computer terminal

Tom Clausen

My graduate work with Professor Wilmer Miller has focused on making and studying various types of solutions of two very different types of polymers: rigid rod (for example, Kevlar, a material used in bullet proof vests) and random coil (everything from polystyrene cups to natural fibers). Rigid rod polymers have a stiff backbone that only allows them to have one conformation in space, whereas random coil polymers have a flexible backbone that allows them to have many conformations approximating a random walk. The problem with mixing these two very different types of materials is that they will separate into phases, almost without exception. I attacked the problem in three ways: first, I looked at rod polymer solutions alone; second, I made and studied solutions of rod and random coil polymers; and, finally, I prepared interpenetrating networks (IPNs) of rigid rod and random coil polymers.

Previous students in Professor Miller's group have determined the phase diagram for a rodlike synthetic polypeptide, poly(g-benzyl-L-glutamate) (PBLG) in various solvents. This polypeptide is a rodlike polymer in solvents that cause it to coil into an a-helix in solution. Rods of PBLG are very stiff, and often used as model rodlike polymers. PBLG's phase behavior closely follows theoretical predictions made by Paul Flory in the 1950's. Most of my work used this material as the rod polymer; however, I also did some collaborative work with colloids that form stiff rods in solution. When PBLG solutions are cooled, they form very rigid reversible gels at low concentrations of polymer. (As little as 0.1% polymer can form a gel in toluene.) I did rheological studies on PBLG solutions to compare the results to theory, to look at the aggregation of PBLG in poor solvents, and to understand the rheology of the gelation process.

Once I had a handle on "simple" two component rod polymer solutions, the next step was to make solutions with random coil polymers. Surprisingly, PBLG will make a three component solution with polystyrene (PS) in dimethylformamide (DMF). DMF is a good solvent for PBLG, and a marginal solvent for PS. I mapped out the phase diagram for this system, compared it with a lattice theory (developed by Flory in the 1970's), and looked at the rheology of the three component system. I also did some work on making IPNs, by first making a PBLG gel and then polymerizing the solvent. In this case, the PBLG is trapped into a network of bundles of rods due to the kinetics of phase separation, and the random coil polymer is formed around the PBLG. I also tried to crosslink the PBLG into a network like a logjam of rods and form an IPN by polymerizing the solvent around that as well. The common thread of all of the work I did was to use my understanding of the phase behavior of these systems to make novel materials and understand their rheology.

I've enjoyed working with Professor Miller, and have learned more than I dreamed about polymer science during my five years here. I received my undergraduate degree in chemical engineering from the University of North Dakota, in Grand Forks. I grew up here in the Twin Cities, so my decision to come to graduate school here had the added benefits of being near friends and family. My sister Sharon teaches the 3rd grade at a school in south Minneapolis, so as a part of the chemistry outreach program , I enjoyed organizing a visit to her school with the people from our lab. I've also enjoyed playing chemistry league softball during my summers, even though I've had to suffer through the Basement Bombers last season. This fall I'll be starting with 3M working in the Process Technologies Laboratory. I'm looking forward to my new job, since it will blend my engineering background with my interests in polymer science.

Christine Eastman

Christine Eastman

My thesis work has focused on investigating self and tracer diffusion in block copolymers. The technique used to measure diffusion coefficients has been forced Rayleigh scattering (FRS). The FRS technique works by writing a chemical grating into the sample and monitoring the erasure of this grating with time. The presence of photoisomerizable dye molecules in the sample allow the chemical grating to be "written." When exposed to the appropriate wavelength and intensity of light, the dye molecule will change its conformation (e.g. *trans* to *cis*). This change in conformation gives rise to a difference in refractive index and/or absorption coefficient between the dye isomers. The grating is actually written into the sample by two crossed argon ion laser beams, which form constructive and destructive interference fringes. In the destructive regions, the dye remains in its lower energy form, while in the constructive regions, the dye is photoisomerized.

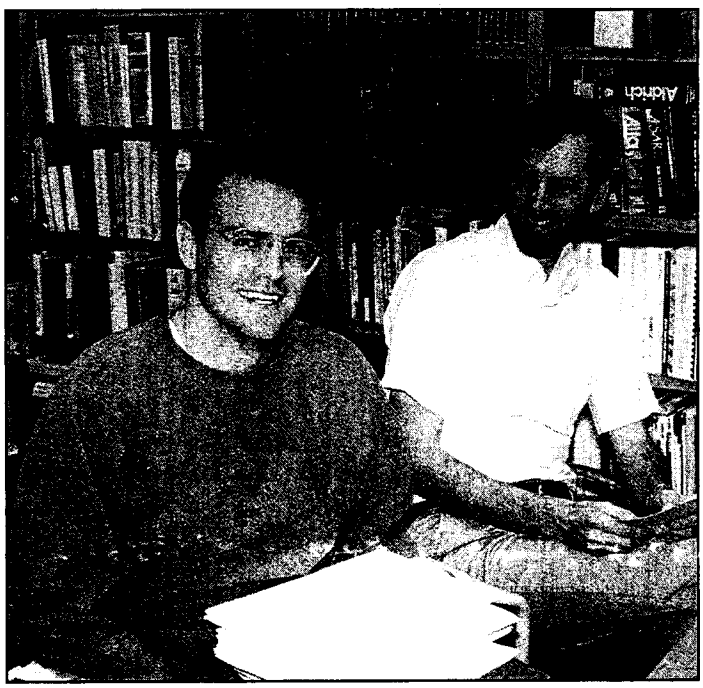
Once the grating has been written into the sample, another laser beam impinges on the sample at the Bragg angle and scatters off the grating. This laser beam is at a wavelength and/or intensity that does not further affect the dye molecules. The scattered light is collected by a photomultiplier tube and the signal is then transmitted to a computer for data collection and analysis. The signal from the light scattered off the grating is an exponential function of time and directly related to the diffusion coefficient.

If polymer diffusion is to be determined by FRS, then it is necessary that the polymer chains be labelled with dye molecules. The labelling process has involved chemically modifying the polymers and attaching the dye molecules without crosslinking the chains.

The interest in block copolymer diffusion stems from the unique ability of these chains to microphase separate and in doing so form an ordered structure (e.g. lamellae or cylinders). This microphase separation is possible because block copolymers are actually two different polymer chains that are covalently bound to form one linear polymer molecule; if the chains were not covalently bound they would phase separate on a macroscopic scale. Relatively little is known about the diffusive motions of block copolymer chains in the ordered state, and thus we have become interested in investigating this area. Results so far indicate that for short chains (12,000 MW) of polystyrene–poly-2-vinylpyridine the self diffusion is not significantly different than that of just 12,000 polystyrene. Thus, in this system the ordered structure of the block copolymer has little effect on diffusion. Currently, measurements are underway to investigate higher molecular weight block copolymers as both tracer and matrix chains.

I grew up in Rochester, Minnesota and graduated from Mayo High School. I received a B.A. in chemistry in 1986 from St. Mary's College in Winona, Minnesota. Then I moved on to the University of Minnesota and obtained my M.S. degree in 1990 with my thesis project being "Polymer and Probe Diffusion in Viscous Solutions" under the tutelage of Professor Timothy Lodge. My Ph.D. research in this group, and my thesis project covering the topics described, is nearing completion. Subsequently, I will be joining the pharmaceuticals division of 3M to work on transdermal drug delivery systems.

During my stay at the University of Minnesota, I have helped with graduate student recruiting by giving tours of the chemistry department, being a graduate student contact and I have even returned to my undergraduate college to talk about my research.

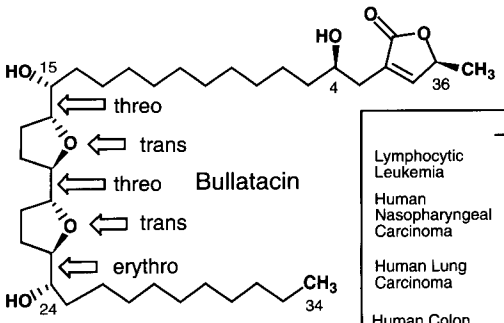


Paul Hanson shares a laugh with his research advisor, Tom Hoye

Paul R. Hanson

I was born in Mason City, Iowa in 1963, and graduated from Hampton High School in 1981. I attended Luther College and majored in chemistry, ran cross country and track, and participated in research directed by Dr. Adrian Docken. In 1985, I participated in the Lando-SOHIO summer research program working with Professor Essie Kariv-Miller, and decided to undertake graduate studies at the University of Minnesota starting in 1987. Upon coming here, I joined the research group of Professor Tom Hoye. Extracurricular activities include: participation in the Chemistry Outreach Program directed by Professor Lou Pignolet; tutoring for the College of Biological Sciences Minority Tutoring Program directed by Dr. Sally Jorgenson; and Peer Advising directed by Susan Page. I also enjoy bicycle racing, cross country running, basketball, baseball, and fishing. My plans after completion of my thesis include a postdoctoral position at Stanford University under Dr. Barry M. Trost and then a career in academics.

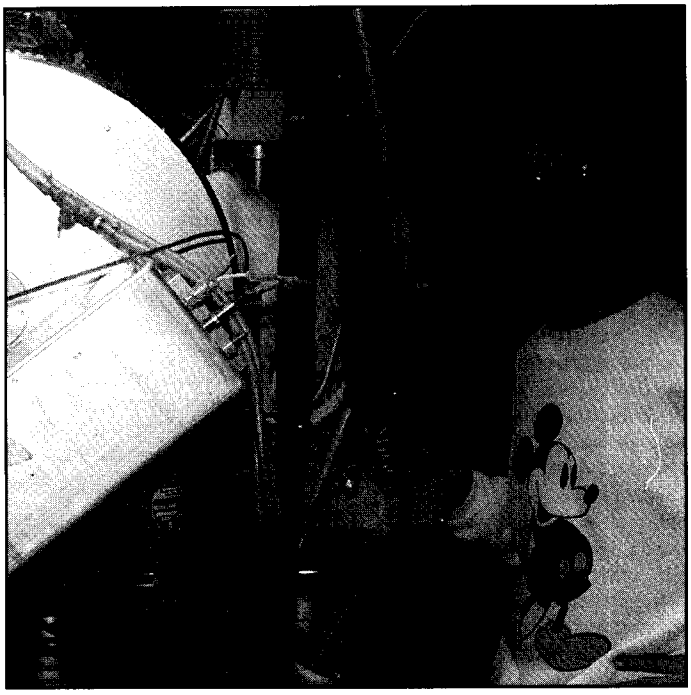
Since 1982 over fifty members of a new class of biologically active compounds known as the *Annonaceous* acetogenins have been discovered. This class of compounds has attracted considerable attention due to their extremely high biological potency including cytotoxic, antitumor (see ED50 values in table), antimalarial, antimicrobial, immunosuppressant, antifeedant, and pesticidal activities. It is now believed that the mode of action of these compounds resides in their ability to shut down the electron transport system within the mitochondria of cells.



	Assay	ED_{50} M
Lymphocytic Leukemia	9PS	$<10^{-8}$
Human Nasopharyngeal Carcinoma	9KB	$<10^{-8}$
Human Lung Carcinoma	A549	$<10^{-8}$
Human Colon Adenocarcinoma	HT29	$<10^{-8}$

These naturally occurring compounds are extracted from shrubs and trees found mainly in the tropical regions. One of the more common species containing these compounds is the pawpaw tree which is native to the United States. Characteristically these compounds contain 35-38 carbon atoms with one or two tetrahydrofuran rings serving as the central structural nucleus. To this core are connected two appendages; one a long hydrocarbon chain and the other a long chain terminated by a polar group, a g-lactone moiety.

My research in the Hoye laboratory involves: 1) The stereoselective chemical synthesis of model compounds which mimic the central tetrahydrofuranyl (THF) and rearranged g-lactone portion of many mono and bis-THF containing *Annonaceous* acetogenins. 2) Obtaining pertinent 1H and ^{13}C nuclear magnetic resonance (NMR) spectroscopic data on these model compounds as a diagnostic tool to assign the relative stereochemistry in the natural compounds containing both of these key regions. 3) ^{1}H and ^{19}F Mosher ester analysis to assign the absolute stereochemistry contained in these systems. 4) The total synthesis of 15,16,*19,20,23,24*-hexepi-uvaricin (a diastereomer of uvaracin, the first isolated member in this series). 5) The synthesis of other analogues to help identify the minimum pharmacophore needed to retain potent antitumor activity. This will hopefully lead to the discovery and synthesis of simpler analogues to be used as cancer chemotherapeutic agents. 6) The total synthesis of the most biologically potent compound in this series, bullatacin. Current work is now aimed at the synthesis of the side-chain containing the C(4) hydroxyl group.



Steve Jons at his beam apparatus

Steven D. Jons

Though an Iowan at heart, I've been a resident of Minnesota for nine years now. After graduating from St. Olaf College in 1987, I moved the short forty miles to the University of Minnesota. With advisors W.R. Gentry of the chemistry department and C.F. Giese of the physics department, I have been doing fundamental research concerning molecular collision dynamics.

Of the three molecular scattering processes, elastic, inelastic, and reactive, the most difficult to study experimentally on the state-to-state level has been inelastic scattering, where energy is transferred from one molecule to another in the form of rotations and vibrations. In terms of developing and testing theories, the most sensitive and hence most useful information to obtain about inelastic processes would be the most basic information, e.g., state-to-state total or differential cross sections. With the help of co-workers in the Gentry lab, my work has involved combining crossed molecular beams with lasers to measure these microscopic quantities.

In all my experiments, inelastic collisions have been studied between a molecule of interest and a structureless atom, such as helium or argon. In the earliest works, initial state selection was provided solely by the supersonic expansion of the molecular beam. (Pre-collision molecules were cooled to low energy rotational and vibrational states, with associated temperatures less than 2 °K and 50 °K, respectively.) Two pulsed molecular beams were then crossed at a variable collision angle, and hence a variable collision energy, and the population of the post-collision vibrational or rotational vibrational states was monitored by laser induced fluorescence (LIF). By scanning wavelength, the population distribution of excited states could be ascertained. By scanning collision angle, while monitoring population within a particular state, the collision energy dependence could be discerned. Using these procedures, measurements were made of excitation probabilities for collisions of *para*-difluorobenzene and *trans*-glyoxal with helium which yielded information on propensity rules and the dynamics of the excitation process.

A major limitation in molecular dynamics has been the inability to prepare molecules prior to collisions in particular rotational vibrational excited levels of the ground electronic state, and a major accomplishment during my tenure has been the addition of stimulated emission pumping, SEP, to the above experiment. SEP is a two laser process. The first laser transfers population from an initially cooled level in the ground electronic state to an intermediate level in an excited electronic state. A second laser, either synchronous or delayed by nanoseconds with respect to the first laser, is then used to drive molecules back down to an excited rotational vibrational level of the ground electronic state via stimulated emission. This method has allowed vibrational and rotational energy transfer to be studied in excited states of iodine and *trans*-glyoxal.

Most recently, my research has involved measuring state-to-state differential cross sections for rotationally resolved excitation of nitric oxide in collisions with argon. Because of the conflicting requirements for resolution and intensity, similar measurements have previously been made for only a few molecules. Even so, these measurements were particularly significant as both spin-orbit changing and conserving collisions were probed. Such work has provided a nearly direct comparison with already existing coupled-states computations at this very basic level and has stimulated other groups to do further calculations.

The different projects on which I've toiled have provided a great breadth of experiences, and I have very much enjoyed *doing* research in the chemistry department (much more than *writing* my thesis). However, after four years in the same field, it was important to me that my next position allow me to explore entirely new subjects. The decision to leave academic pursuits was difficult, but I've recently committed to "do great things" at Dow Chemical, starting in December. A particular draw was their Research Assignments Program through which I will work in several distinct areas of the company during my first fourteen months.

(Students to page 12)

Alumni Reports

Conforming to our established format, we present name, degree and year, advisor, current professional affiliation, and (occasionally edited) narratives. Kathy Ross will be happy to help you contact these or any of our alumni by providing addresses and phone numbers (if known).

Roger L. Abler (M.S. '56, L. I. Smith), retired.

I retired from 3M in August of 1991, after completing 35 years of service. My most recent work involved patents and regulatory issues.

John Ahlquist (M.S. '72, W. Salo and P. Anderson), Anoka Senior High, Anoka, Minnesota.

I enjoyed my two years (1970-72) very much. It was excellent preparation for my 19 years (and counting) as a high school chemistry and physics teacher. It certainly made me more prepared. I have taught over 4000 students, and have enthusiastically recommended the University of Minnesota to them all. Thanks for a great education.

Heinz B. Arnold (M.S. '50, R. T. Arnold), retired.

Mark E. Brigham (B.Chem. '88, W. E. Noland), U. S. Geological Survey, St. Paul, Minnesota.

Keith W. Byerly (B.Chem. '69), A. P. Green Industries, Inc., Mexico, Missouri.

Li-Chin Chiang (Ph.D. '59, O. Gisvold), Institute of Photographic Chemistry, Academia Sinica, Beijing, People's Republic of China.

I am now a professor of chemistry doing research work in photochemistry. I am a member of the standing committee of the Chinese Academy of Sciences.

Ronald J. Fitzgerald (B.Chem. '64), deceased.

Ron, a native of Gibbon, Minnesota, obtained his Ph.D. in Chemistry from the University of Illinois and his M.D. from the University of Chicago. He was chief resident in psychiatry at Northwestern University, and joined Kaiser Permanente at Fontana, California, in 1979. In 1985, he was named chief of psychiatry at Kaiser Permanente. He was president of the Inland Chapter of the Southern California Psychiatric Association, and fellow of the American Psychiatric Association. He served as clinical adjunct professor at the Southern California School of Theology in Clarement, California, and as a psychiatric consultant to the Clinebell Institute. He passed away on April 9, 1992, and is survived by Terry, his widow, and his mother, Elvira Loftness, of Gibbon, Minnesota (reported to us by Gerald W. Cook).

Daniel P. Getman (Ph.D. '82, P. G. Gassman), Monsanto, St. Louis, Missouri.

Daniel P. Getman has been named a Fellow in Monsanto Company's program to recognize those individuals making significant, continuing technical contributions to the company and to their specific disciplines. An Associate Fellow in the Chemical Sciences Department, Dan joined Monsanto in 1982 as senior research fellow and assumed his current position in 1990. Dr. Getman is recognized for his contributions to the discovery of potential therapies for human pathogens, particularly those to inhibit human immunodeficiency virus (HIV). "Dr. Getman is one of the brightest young stars on Monsanto's pharmaceutical discovery team. He is the model of a Fellow-Manager, directly driving an important research program while providing leadership to his group," said Philip Needleman, Vice President, Monsanto Corporate Research, in announcing the appointment. "Health care is an area of major importance to the company, and Dr. Getman's work could lead to the development of effective treatments for some of today's most challenging diseases," Dr. Needleman said. As a graduate student at Minnesota, Dan was honored by the Stanwood Johnston Memorial Fellowship (1980) and the Silver Beaker Award (1981). He is the co-inventor of 11 U. S. patents, and has several patent applications pending. (Based on information provided by Monsanto's public relations department).

Don D. Gilbert (Ph.D. '59, E. B. Sandell), Department of Chemistry, Northern Arizona University, Flagstaff, Arizona.

Ralph C. Golike (Ph.D. '55, B. L. Crawford), retired.

Nothing new; I just wanted to tell you how much I enjoy the newsletter.

James H. Gollop (B.A. '81, H. S. Swofford, Jr.), Hawaii State Department of Health, TB Program, Honolulu, Hawaii.

I graduated from medical school in 1985, and completed a Master's degree in public health in 1988. My present position, for the last two years, has been with the tuberculosis program as a physician. In addition to beautiful beaches, Hawaii has one of the highest TB rates in the nation, keeping us busy.

Thanks for your informative newsletter, and for keeping in touch in spite of the long time passed and the distance moved.

Susan M. Gustafson (Ernst; B.Chem. '85, T. S. Livinghouse), Phillips Laboratory, Edwards Air Force Base, California.

I completed my Ph.D. in March of 1991 at UCLA and have been working at Phillips Laboratory since that time. I work in the materials calculations group, where we are developing new high energy density materials.

As noted above, I received my B.Chem. degree under the name Susan Ernst, and have since married and changed my name to Susan Gustafson. I plan to return to the Twin Cities area when my contract with the Air Force is finished.

Joseph B. Hanson (Ph.D. '76, R. M. Dodson), Amoco Chemicals Far East, Ltd., Hong Kong.

After several assignments in research and marketing, I am now manager of business development in Amoco's Far East Headquarters in Hong Kong, where I have been for two years. Hong Kong is our hub, but our activity is in sixteen countries, extending from Pakistan to New Zealand and from Japan to Indonesia, so I travel about 60–70% of the time. The purpose of my group is to identify and establish chemical investment projects in our region. Chemical industry growth and competition are very strong in the Far East, so it is an exciting place to work.

Hong Kong and the Far East are also exciting places to live and travel. Among the risks, which range from violent politics to volcanoes and typhoons, I believe the risk of eating one's self to death is the greatest. My wife and daughter live with me in Hong Kong, and my son is in college in the States.

If you pass through Hong Kong and have forgotten my number, "I'm in the book."

Allen J. Hubin (M.S. '61, S. W. Fenton), 3M Company, St. Paul, Minnesota.

After receiving my M.S. in Organic Chemistry in 1961, I joined 3M. For some eight years I was engaged in polymer research, with nine U.S. patents resulting. I then spent five years in patent liaison work, first with a U.S. division and then in international operations. Thirteen years in human resources followed, the first five years involving technical education and training programs, the latter eight involving a human resources generalist role with client 3M organizations. In 1988, I came back to international, where I head a function which administers 3M's OUS (Outside United States) patent and trademark portfolio and provides liaison on intellectual property matters to our OUS laboratories and subsidiaries.

In the non-technical area, I have pursued a lifelong interest in crime (mystery, detective, spy, suspense) fiction as a reviewer (some 2000 published reviews, including a three-year stint with the New York Times Book Review), magazine publisher and editor (the quarterly journal called "The Armchair Detective" originated in my basement in 1967 and continues to be published 25 years later, though my role is now only as a book reviewer), book editor (seven anthologies of crime short stories), and bibliographer (three volumes providing comprehensive coverage of English language crime fiction in book form have been published, and a fourth is under contract), among other activities.

My wife of nearly 34 years, Marilyn, and I rejoice in five children and five grandchildren.

Scott Allen Jenkins (Ph.D. '90, T. R. Hoye), The Nutrasweet Company, Mount Prospect, Illinois.

After leaving the University of Minnesota, I started at Sandoz Crop Protection, as a senior scientist in the process technology group. My work focused on the discovery and development of new chemical processes for agricultural chemicals. I received three presidential awards, two for my contributions to research projects, and the third for development of a computerized chemical information system.

This new system was very successful and participation was run on a computer network and used bar codes to track all the chemicals in the building. By linking this system to computerized materials safety data sheets (MSDS) information, the entire group was safer and more productive. *Research and Development* magazine published my article about an effective chemical inventory system for the '90's, which was awarded first prize in the 1991 Chicago publishers association contest. I also co-founded a scientific based software company, named WillStein Software, Inc. We produce products for data acquisition and control for GC's, LC's, MSD's, and other analytical equipment, LabView consulting and custom programming, and chemical inventory systems and services.

The most important thing that happened in 1991 is that I was married. In May 1992 I accepted a senior research scientist position at in the chemical process sciences group at Nutrasweet. My work is now focusing on the development of a new sweetener and other internal entrepreneurial ventures.

Charles Bruce Koons (Ph.D. '58, W. M. Lauer), retired.

In 1989, I retired from Exxon after a 31 year career with that company. I worked primarily in research, in the fields of organic geochemistry and environmental chemistry. I served on two National Academy of Science committees which prepared reports on the fate and effects of petroleum in the marine environment. Since retirement, I have been consulting in environmental chemistry, principally on the *Exxon Valdez* oil spill in Prince William Sound, Alaska. I also continue to serve on a National Academy of Science committee which is evaluating the research conducted on the outer continental shelf of the U.S.

Craig W. Lawson (Ph.D. '73, S. Lipsky), Shell Oil Company, Houston, Texas.

George C. Licke (B.Chem. '62, W. E. Noland), The Bait Shop, Deer River, Minnesota.

I received my Ph.D. in organic photochemistry from the University of Wisconsin in 1967 (H. E. Zimmerman-advisor). I was employed by Ethyl Corporation in Ferndale, Michigan until May of 1976. I then left the field of chemistry to go into business for myself. I purchased Bahr's Motel and sold it in 1987. I purchased the Bait Shop in December of 1987, where I am now.

Amy Muller (Ph.D. '84, P. W. Carr), AT&T Bell Labs, Murray Hill, New Jersey.

I was recently promoted to Distinguished Member of the Technical Staff (from Member of the Technical Staff)–this is an honor achieved by about 10% of the staff, and means I now get secretarial services (I owe it all to Pete!). I married Drew Kocisko, former member of the glass technology services staff in Kolthoff Hall, and now Drew has his own glass blowing shop, Progressive Glass Apparatus. Drew and I enjoy windsurfing and mountain biking in New Jersey, and we have four cats and no kids.

Jim O'Brien (Ph.D. '68, W. E. Noland), Southwest Missouri State University, Springfield, Missouri.

In 1991, I was named Distinguished Professor of Chemistry at Southwest Missouri State University. In 1992, I received the Southwest Missouri State University Excellence in Teaching Award.

Gary V. Olhoft (B.Chem. '66, R. C. Brasted), Union Carbide Corporation,
Cary, North Carolina.

In June 1991, I completed 25 years with Union Carbide. Most of those years I have been involved with technical service for resins and latexes going into coatings. From 1988 to 1991, I was director of the total quality process for the UCAR Emulsion Systems business (we manufacture latexes). Currently, I am a business manager for latex products sold into the adhesive, caulk and sealants markets. I find the combination of technical understanding and business skills this job requires very enjoyable.

Thomas Ostertag (B.Chem. '65, R. M. Dodson), Honeywell, Inc., Minneapolis, Minnesota.

I have been at Honeywell Avionics for the last 17 years, in the materials and process engineering department. My activities include failure analysis, process control, and materials applications. One major project is replacing CFC's in our facility with aqueous and semi-aqueous cleaners. I am a member of the ACS and am the topical group chair for analytical chemistry. I am also involved with the Society for Applied Spectroscopy.

Jung Hag Park (Ph.D. '88, P. W. Carr), Yeungnam University, Seoul, Korea.

I am a professor in the Department of Chemistry.

Robert G. Parr (Ph.D. '47, B. L. Crawford, Jr.), University of North Carolina at Chapel Hill, North Carolina.

To circumvent retirement, I resigned my tenured professorship in the summer of 1991 and was immediately reappointed to the same post for a fixed five year term. I am Wassily Hoeffding Professor of Chemical Physics. Also in 1991, I was elected President of the International Academy of Quantum Molecular Science for a term of three years.

Sheri L. Haines Peterson (M.S. '83, R. G. Bryant), Land O'Lakes, Inc., Minneapolis, Minnesota.

I have been with Land O'Lakes analytical department since August, 1990 as quality control chemist. I have duties of establishing and monitoring QA/QC programs for food and wastewater testing and I oversee safety and hazardous waste management. I was instrumental in obtaining State of Minnesota/ Wisconsin Wastewater certification and USDA meat/poultry accreditation for composition and residues.

Manuel J. Rivas (B.Chem. '83, L. H. Pignolet), Color Converting Industries, Des Moines, Iowa.

I am currently working in the research and development department for this leading manufacturer of inks for the flexible packaging industry. Before joining Color Converting, I worked in Venezuela as product development and quality control manager for a pressure sensitive adhesive materials and specialty coatings manufacturer. I stayed in Venezuela for two and a half years, and came back to the USA and worked for IBM Rochester in their integrated technologies laboratory as contamination control in microprocessor manufacturing.

I am very proud of the degree I obtained at the University of Minnesota and of the accomplishments I have made thanks to my education there. Thanks.

Rob Rosen (Ph.D. '84, T. R. Hoye), Rohm and Haas Company, Bristol, Pennsylvania.

For the past several years I have been a quality management consultant in our engineering division. I've found helping an organization transform itself to become more quality and customer focused to be much more satisfying than doing chemical research! I also completed an M.B.A. from Temple University at the end of 1991.

Curt Schmidt (B.Chem. '79), Rosemount, Inc., Burnsville, Minnesota.

I have been employed as a safety/environmental administrator with Rosemount's aerospace division since August, 1990. Aside from conducting employee training, coordinating hazardous waste shipments, securing permits and related tasks, I'm heavily involved in pollution prevention and waste minimization.

I also have an M.B.A. from Wright State University, Dayton, Ohio (1988), which I obtained during my service in the Air Force.

John J. Talley (Ph.D. '79, P. G. Gassman), Monsanto, St. Louis, Missouri.

John J. Talley was recently appointed a Monsanto Fellow. His work as an Associate Fellow in the Chemical Sciences Department of Monsanto Corporate Research (MCR) was cited as "critical in identifying our lead candidates to inhibit human immunodeficiency virus (HIV)." Philip Needleman, Vice President of MCR, continued his praise with the words, "[Dr Talley] is vital to the effort which is a multi-disciplinary program with Searle, Monsanto's pharmaceutical subsidiary." Dr. Talley's other academic honors include Procter and Gamble Fellow (1977); the Outstanding Organic Chemistry Graduate Student Award (1977) and Dissertation Fellow (1978), both from the University of Minnesota; and 3M Company Fellow (1979). He holds 13 U.S. patents and has a number of applications pending, and has been invited to speak at major universities (*Ed. note*: including his *alma mater*, on May 22, 1992) and present papers at various technical meetings and symposia. He joined Monsanto as a senior research specialist in 1986, and assumed his current position in 1988 (reported to us by Monsanto's public relations department).

Gnanarajah Thambo (Ph.D. '90, W. G. Miller), Emulsion Polymer Institute, Lehigh University, Bethlehem, Pennsylvania.

I have been involved in developing emulsion binders for non-woven cellulose fiber mats, and in developing suspending agents for styrene-acrylonitrile copolymer systems.

Sharon van den Berghe-Snorek (M.S. '84, M. T. Stankovich), Eli Lilly & Company, Lafayette, Indiana.

Sharon received an Outstanding Associate Recognition Award for 1991 from Eli Lilly & Company, on the basis of her work supporting the European re-registration of the drug Fenoprofen. Sharon developed and validated assay methodology used to analyze bulk Fenoprofen and also worked with fomulated drug products in these studies (reported to us by Marian Stankovich).

Sheng-Hsu Zee (Ph.D. '66, W. E. Noland), National Tsing-Hua University, Taiwan, Republic of China.

Also Noted

Clinton K. Harrington (Ph.D., P. G. Gassman, Ohio State University), died due to an aneurysm in June, 1992, at age 43. Although his degree in organic chemistry was from his home institution, he moved to Minnesota with his advisor in the mid-70's and did most of his thesis work here. He was employed by The Dow Chemical Company as a research manager, and visited Minnesota often during graduate placement season, maintaining contact with his many friends here. He and his wife Marie had lived in Midland, Michigan since 1979.

Leonard C. Odell died in October, 1991, at his home in Edina, Minnesota, at age 83. Odell was an undergraduate chemistry student here, but left school prior to receiving his degree. Working in the family business, he created the early Burma Shave jingles with his brother, Allan. He was also an accomplished jazz clarinet player.

Liz Ottinger with reams of data

Elizabeth Ottinger

I began my career in chemistry at Franklin and Marshall College, where I received my undergraduate education and carried out research under the direction of Professor Marcus Thomsen, also a graduate of the University of Minnesota. He was an important influence on my choice to attend the University of Minnesota for my Ph.D. program. I am presently in my fourth year of graduate school, and my advisor is Professor George Barany. Overall, I have had a very positive graduate experience, which I attribute to all the help I have received from my advisor and fellow graduate students. In my research, I have had the opportunity to diversify my background by pursuing my interests in both the chemistry and biology of my project. I interact a great deal with Professor David Bernlohr and his group in the Biochemistry Department at the University of Minnesota. I have enjoyed the chance to branch out into another field and to learn different techniques. I have also been able to do some traveling and present my research. Last June, I went to Boston for the American Peptide Symposium and in September, I went to Interlaken, Switzerland, for the European Peptide Symposium. Besides my research, I have been actively involved in programs to help recruit students by being a student contact, and I have taken part in the peer advising program to help new graduate students. I am also involved in the outreach program in which we go out to area schools to give chemistry demonstrations in the hope of getting more students interested and excited about science.

My thesis work involves the study of phosphorylation of proteins, a post-translational modification known to be of importance in the regulation of pathways by which hormones, growth factors, neurotransmitters, and toxins function. The phosphorylation and dephosphorylation of proteins is carried out by enzymes known as protein kinases and phosphatases, respectively. Phosphorylated protein segments, phosphopeptides, can be used as probes to investigate the mechanisms of action and structural requirements important to the activity of protein kinases and phosphatases. However, phosphopeptides and phosphoproteins are made in small quantities in the cell and are difficult to isolate and purify. Therefore, the development of methods for the chemical synthesis to phosphopeptides of any length and amino acid composition has become desirable to study the role of these two classes of enzymes in the regulation of cellular processes.

My research project is directed toward two areas. One aspect is the development of mild chemical methods for the synthesis of peptides containing phosphorylated amino acid residues. My project utilizes the techniques of solid-phase peptide synthesis. I have been investigating existing methods for the synthesis of phosphopeptides on the solid support resin in order to optimize conditions. I have also been working on the development of new phosphoamino acid derivatives to use in the stepwise synthesis of the peptide chain. The second parallel aspect is to use the chemically synthesized phosphopeptides in biological assays to measure the activities of enzyme phosphatases. In this area, I have recently finished a study of two phosphatases, the rat brain phosphatase and the human adipocyte acid phosphatase. As substrates, I tested peptides that correlate to the tyrosine phosphorylation site of human adipocyte lipid binding protein; a protein thought to be important to the action of insulin in the regulation of cellular metabolism. In the coming year, I will be synthesizing phosphopeptides corresponding to the insulin receptor in order to determine proteins that interact directly with the receptor and play a role in the insulin signaling pathway.

After I finish my thesis research, I hope to carry out a postdoctoral study in biochemistry or molecular biology so I can continue to complement my organic chemistry background with biological aspects. My long term career goal is to pursue an academic career in teaching and research on biological problems.

Leah Schnaith in her lab

Leah Schnaith

Transition metals catalyze numerous chemical reactions involving biological systems, including the cleavage of DNA. Deoxyribonucleic acid (DNA) cleaving reagents are used as anti-tumor agents which cut and thereby destroy, the DNA of cancer cells. Some other DNA cleaving agents are used to locate where proteins bind DNA. My research involves studying the DNA chemistry of a binuclear iron complex that binds H_2O_2 and cuts plasmid DNA (double stranded, circular and twisted, i.e. supercoiled).

My DNA cleavage agent is unique because it preferentially cuts the plasmid DNA between two of the 4362 DNA base pairs 60% of the time. This preferential cutting is caused by an interaction between the diiron complex and the secondary structure of the DNA (namely supercoiling/ twisting). I ruled out the possibility that the complex binds to a specific sequence of DNA bases (A, T, G or C) since relaxing the plasmid twisting loses the preferential cutting. Furthermore, even when I removed 200-700 bases from the area which is preferentially cut by the cleavage agent, a new site is created. Finally, this preference can be altered by modifying the ligand structure of the complex. This preferential cutting agent may be useful for locating similar structures on other DNAs.

I have also discovered that the chemical mechanism by which the reagent cuts DNA is unique. Unlike most known chemical cleaving agents, this complex cuts the DNA by a hydrolytic mechanism (adding H_2O across the phosphate). This means that the complex breaks the DNA phosphate backbone creating 3'-OH and 5'-$OPO_3R^=$ ends, which can be rejoined later with an enzyme called ligase. This property could make the diiron complex useful for cutting human chromosomal DNA into small pieces that can be sequenced (order of base pairs determined). Once the sequence is known genetic diseases (caused by mutations or changes in the DNA sequence) may be discovered and corrected. The diiron complex could be tethered to an oligonucleotide (small single stranded DNA) or a peptide (small number of amino acid) to create a cleaving agent which would cut specifically at a chromosome causing a disease.

Originally from Hastings, Minnesota, I have remained in the state throughout my education. I graduated in 1988 from St. Olaf college *cum laude* with a B.A. degree in chemistry. I began graduate school at the University of Minnesota that fall in the joint disciplines of biological and inorganic chemistry, working for Professor Lawrence Que Jr. Presently, I am partially funded by an N.I.H. (National Institutes of Health) fellowship. On campus I have enjoyed peer advising, giving departmental tours and ushering at Northrup Aditorium. I am kept busy with my house near Como Park and teaching fourth grade Sunday school. Upon completing my Ph.D., I would like to find a teaching position at a small college or work in a forensics laboratory.

Larry Zazzera contemplates his next experiment

Larry Zazzera

The research I am working on today evolved from an early interest in surface and interface characterization. I became interested in this area of research when I participated in an undergraduate research program at the University of Delaware and then later accepted a co-op position at the Du Pont Experimental Station. After receiving my bachelors degree in chemistry from the University of Delaware in 1984, I moved to Minnesota to work for a manufacturer of semiconductor process equipment. The responsibilities of my new job included development and characterization of cleaning processes for semiconductor materials.

When I arrived at the chemistry department in September of 1989, Professor John Evans, my eventual advisor, was enticing me with research projects in the areas of high Tc superconductors, organometallic chemical vapor deposition and polymer adhesion. All of these projects appealed to me and were appropriate for my Materials Chemistry specialty area. I selected the polymer adhesion project.

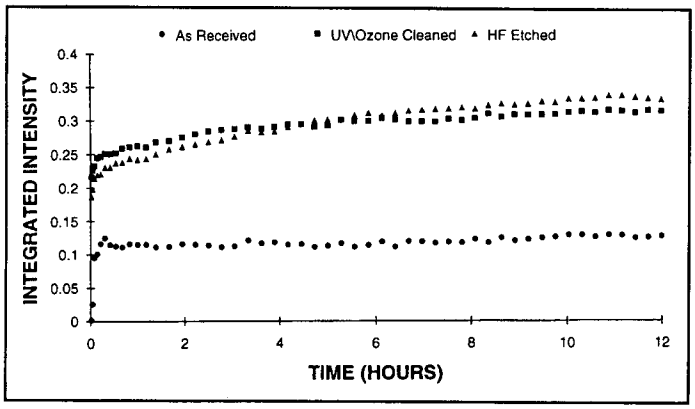
My adhesion research involves studying the chemical interactions and adsorption dynamics between acrylic polymers and silicon substrates. I suggested to John at the start of the project that we use silicon as the substrate because I had become familiar with processes used to influence silicon surface chemistry while I was employed in the semiconductor industry. Additionally, the interface between silicon or silicon dioxide and polymers is important in many technologies including microelectronics and composites.

The goal of a typical experiment is to determine the number of polymer segments which are attached to the substrate during the adsorption process. The objective here is to provide a more thorough understanding of the polymer microstructure at these interfaces. For PMMA adsorption onto silicon dioxide this involves measuring the formation of hydrogen bonds at the interface using infrared spectroscopy. IR spectroscopy is particularly useful in the study of polymer adsorption onto silicon surfaces, because silicon is transparent to most of the IR spectrum. The transparent nature of the silicon substrate allows us to employ internal reflection spectroscopy which is more amenable for *in situ* studies of surfaces. We constructed an internal reflection infrared cell to study the initial chemical modification of the Si(100) surface and the subsequent interface formed during adsorption of polymer onto the substrate. All surface modification pre-treatments and polymer adsorption are performed while the silicon substrate remains in the infrared optics.

In these types of studies, it is desirable to work with surfaces in a controlled and reproducible chemical state, rather than the contaminated surfaces that result from exposure to the laboratory ambient. The initial surface modification includes removal of hydrocarbon contamination by exposing the substrate to ozone which is generated by a photochemical reaction in the infrared cell. The ozone clean yields a hydrophilic substrate with a silanol rich surface. The Si-OH functionality terminating the clean silicon substrate can be transformed into a Si-H termination by exposing the thin oxide layer to a dilute aqueous solution of hydrofluoric acid. The formation of the terminating hydride layer is evident from the growth of a Si-H stretch band at 2100 cm^{-1}. I am always impressed when we observe the growth of the Si-H stretching band because it demonstrates that small quantities of sample, a monolayer of hydrogen on silicon (approx. $1x10^{15}$ atoms/cm^2), can be detected *in situ* with a benchtop IR spectrometer.

These surface modifications yield different surface chemistries which will influence polymer adsorption. PMMA adsorption onto these surfaces is studied by monitoring the carbonyl stretch from the polymer. The amount of polymer adsorbed is determined by measuring the total integrated C=O band intensity from 1760 to 1670 cm^{-1}. The percent of PMMA segments hydrogen bonded to the substrate is determined from the ratio of the 1707 cm^{-1} peak (H-bonded C=O) over the total integrated C=O intensity. The total integrated band intensity versus adsorption time and the percent (**P**) of PMMA segments hydrogen bonded to the substrate at the conclusion of the experiments are given in the figure. The values of **P** indicate that hydrogen bond formation is inhibited by hydrocarbon contamination or Si-H formation, and the integrated carbonyl intensities indicate that the relative amount of polymer adsorbed onto the UV/ozone cleaned and HF etched surface was significantly greater than the contaminated surface.

I will use the upcoming academic year to develop conclusions regarding my research and then I plan to re-enter the industrial work force upon completion of my Ph.D. degree in July of 1993.



*The total integrated carbonyl band intensity versus PMMA adsorption time onto the as received silicon, the UV/ozone cleaned silicon dioxide and the silicon hydride produced by HF etching. **P** is the percent of PMMA segments hydrogen bonded to the substrate at the conclusion of each experiment (J. F. Evans and L. Zazzera, unpublished results).*

Highly Cited Chemistry

Professor **Donald G. Truhlar** ranked eleventh among the world's chemists and chemical engineers in the number of citations of his 1984–1990 papers. The publication, *Science Watch*, examined all of the citations of 377,790 articles, reviews, and notes published in the 339 principal chemistry journals in this period. In ranking individuals they considered only people whose papers attracted at least 15 citations per paper on average, to eliminate those who might rank high just by the sheer number of their papers. The remaining scientists were ranked according to their total number of citations. Truhlar published 104 papers between 1984 and 1990, and they were cited 2,071 times; an average of nearly 20 citations per paper. The citation champion was Dr. **Ad Bax** of the National Institutes of Health, with 3,048 citations of 64 papers.

Professor **Michael L. Gross** of the University of Nebraska, and a Minnesota alumnus (Ph.D. '66, E. A. Hill) ranked 47th in the same survey. He collected 1,216 citations of 58 papers.

The *Science Watch* survey ranked the combined chemistry and chemical engineering departments of the University of Minnesota seventh in total number of publications, 1984–1990, with 1,067. This was right below neighboring University of Wisconsin, Madison. The university producing the largest number of chemistry and chemical engineering papers was Texas, Austin, with 1,521.

Minnesota chemistry and chemical engineering papers were cited an average of 12.79 times each, compared to a world-wide average of 5.33 citations per paper and a U.S. average of 8.41 citations. Minnesota was 22nd in that respect among institutions producing at least 250 papers. In number of citations per paper, California Institute of Technology (Cal Tech) led the pack, with 18.44.

The number of citations is regarded as a rough indication of the usefulness of scientific work.

Curt Marcott Honored with Williams-Wright Award

It was recently announced that **Curt Marcott** will receive the 1992 Williams-Wright Award. This international award sponsored by the Coblentz Society is presented annually at the Pittsburgh Conference to an industrial spectroscopist who has made significant contributions to vibrational spectroscopy while working in industry. Curt received his Ph.D. from our department under the direction of **Al Moscowitz** and **John Overend** in 1979, where he studied vibrational circular dichroism (VCD). He has worked at the Procter & Gamble Company in Cincinnati, Ohio since 1979. He currently manages the Corporate Research Division IR Spectroscopy Laboratory at Miami Valley Laboratories where he has responsibility for advancing the IR capabilities of the company and providing support to chemical characterization problems. Curt has built upon his Minnesota expertise in VCD to develop the foundation of double-modulation measurements such as Fourier transform infrared reflection-absorption spectroscopy, and eventually the dynamic infrared linear dichroism and two-dimensional IR techniques invented at P&G in partnership with Isao Noda. He has published over 50 articles and presented over 70 talks.

Previous recipients of the Williams-Wright Award are Norman Wright (1978), Norman Colthrup (1979), Jeannette Grasselli (1980), Paul Wilks/James Harrick (1981), Robert Hannah (1982), Harry Willis (1983), Bob Jakovson (1984), Clara Craver/Richard Nyquist (1985), Abe Savitzky/Joseph Barret (1986), Lee Smith (1987), Darwin Wood (1988), Bruce Chase (1989), John Rabolt (1990), Bob Obremski (1991), and Timothy Harris (1992). The prize includes a $1,000 cash prize plus a travel allowance to the Pittsburgh Conference.

We Thank You

Alumni and friends of chemistry have continued to indicate their faith in our programs by their financial support. Donors participate in exactly the kind of cooperation between academia, industry and the public which will help to ensure the health and growth of all three sectors in the future. Thanks to these individuals and organizations, chemistry has maintained its high ranking among university departments in its level of outside support at a time of severe financial constraints. If you are interested in further information about the various funds, please contact Kathy Ross (612/624-6000). We gratefully acknowledge private donors to the department during the period July, 1991 to June, 1992.

The Kolthoff **Fund**, which since 1979 has supported a lectureship series of the same name, has brought to our campus many distinguished scientists, who spend Kolthoff Lecture week meeting with faculty and students, and also deliver a series of lectures open to the public. This year, we were pleased to feature Brian F. G. Johnson (University of Edinburgh, Scotland; Fall, 1991), Peter Dervan (California Institute of Technology; Winter, 1992), and Alexander Pines (University of California, Berkeley; Spring, 1992). Donors were Grace Po-Yuen Chiu, Joel A. Fischer, Nile N. Frawley, Willa I. Guss, Charles M. Hall, Albert C. Holler, Jerome Margulies, James J. Markham, John J. McBrady, Carl O. Nilsen, Yutaka Okinaka, Philip C. Price, Maurice E. Stansby, and A. Earl Vivino.

The **Chemistry Special Projects Fund** is the general discretionary fund for the department and supports many special activities for which there are no other sources of funding. Our first priority for the use of this fund is fellowship and scholarship support of our students at both the undergraduate and graduate levels. Contributors were Harmon B. Abrahamson, Courtland L. Agre, Steven J. Albrechtsen, C. J. Alexander, Carl J. Almer, Roger W. Amidon, Clifford J. Anderson, Jeffrey J. Anderson, Marie P. Anderson, Robert N. Anderson, Charles A. Anker, John A. Anthes, Madolyn Youse Babcock, Donna M. Bahls, Jerold O. Bahls, Keith B. Bailey, John J. Baldwin, Charles E. Bartsch, Robert L. Batdorf, Wadim Batorewicz, Donavon F. Beaver, Robert D. Berg, Steve J. Bezuk, James M. Bierman, John H. Birely, Leonard F. Bjeldanes, William D. Blackley, Margaret R. Blake, Kay Youngdahl Blohowiak, G. Bohnert Bodem, Leo F. Bohanon, Bruce A. Bohnen, Newman M. Bortnick, David C. Boyd, Larry J. Bresina, Mark E. Brigham, Thomas B. Brill, Nicolas Brodoway, Dow E. Brophy, Kirk P. Brown, William E. Brown, Gary W. Brudvig, Albert V. Buettner, Richard O. Burmeister, Jr., Robert B. Carlin, Edward M. Carr, Chi Chang, Jonathan N. Chasman, Sze-Foo Chien, Yeh M. Chow, Clayton G. Christensen, Dale L. Christensen, Paul J. Christensen, Phyllis H. Christensen, Gerald G. Christiansen, Koo H. Chung, Henry B. Clark, III, Matthew C. Comstock, Jeffrey A. Cooper, Martha E. Copeland, Guy A. Cordonier, Helen B. Cost, Ruth Crawford, Frank A. Cutler, Jr., Susan M. Daluge, Eugene P. Danilenko, Darwin D. Davis, George E. Davis, Joseph F. Dellaria, Jr., Robert W. DeNet, Eric H. Detlefs, Eugene DeWald, Diane R. Dittenhafer, Mark M. Doherty, Karen D. Donnelly, Daniel H. Doughty, Charlotte R. Drenckhahn, Peter G. Duane, Kasmer E. Dykoski, James J. Eaton, Kent R. Edwards, Gilbert L. Eian, James A. Elberling, Bentley W. Elliott, Otto C. Elmer, Edward A. Engman, Lori S. H. Enrico, Ronald J. Eshleman, Jurgen H. Exner, David R. Filpula, Lee C. Fischer, Milton H. Fischer, Marvin W. Formo, Robert W. Freerksen, William P. Friday, Phillip Frisch, Frederic R. Furuya, Mary Lou Gantzer, Daniel P. Getman, Don D. Gilbert, Terry J. Gilbertson, Norman W. Gill, Colette L. Goderstad, Norman R. Gould, Bob G. Gower, Robert W. Grady, Sarah A. Green, Robert S. Gremban, Rachel K. Grieger, George W. Griesgraber, Gregory S. Gross, William H. Gumprecht, Cyrus O. Guss, Frederick J. Gustafson, Arlin E. Gyberg, Richard T. Haasch, Brian J. Hales, David A. Halsrud, Charles F. Hammer, Maxine B. and John E. Hancock, Michael J. Hansel, Warren Hanson, Willard A. Hareland, Lorin D. Hargrove, Darrel M. Harris, Lucille L. Hay, Dora K. Hayes, Thomas G. Hayes, Todd R. Hayes, Jerome R. Heiman, Walden L. Heino, Mattie H. Helwig, Arthemise A. Heney, Jerry A. Herby, Philip B. Herman, Gerald V. Hier, Robert E. Hileman, Otto J. Hill, Charles W. Hobbs, Milton L. Hoefle, Nicholas J. Horvath, Paul D. Hovde, Jerry D. Hoyt, Steven E. Huseby, Jonathan E. Hutchins, Debra J. Hutson, Gary G. Irish, Phillip D. Isaacs, Henry V. Isaacson, Joel R. Jacobson, Kay F. Jamieson, E. Harry Jancis, Michael Jarcho, Colin J. Jellish, Bryan M. Jewison, August R. Johansson, Eugene C. Johnsen, Charles D. Johnson, John A. Johnson, Kenneth E. Johnson, Patrick L. Johnson, Roger D. Johnson, Roy A. Johnson, Susan A. Johnson, Thomas H. Johnson, William K. Johnson, Alan R. Johnston, David C. Johnston, Bradley S. Karon, Paul J. Killian, Wallace A. Kirkpatrick, Michael A. Knoll, James K. Knudsen, John G. Koland, Kenneth E. Kosel, Horatio H. Krause, Jr., Richard J. Kvitek, Gary W. Y. Kwong, Roger W. Kwong, Lawrence L. Landucci, James F. Lang, J. Lanphear and G. Proehl, William A. Larson, Paul M. Leach, Richard J. Legare, Stephen R. Levitan, Tai-Ming Liang, Steven C. Lien, Juei-Hua Lin, Robert M. Lindquist, Harold V. Lindstrom, Louis J. Ling, Lawrence Locken, Thomas W. Lorsbach, William E. Lundquist.

Andrew S. Magee, Joel G. Malmberg, Curtis A. Marcott, Brian J. Martin, Francis W. Martin, Mark W. Martinson, Albert S. Matlack, Pamela A. Matsch, Jay S. Mattsfield, Bruce M. Mattson, James H. Maysilles, Donald J. McClure, Donald S. McClure, John C. McCool, Blaine C. McKusick, Robert J. McNair, III, Faith C. McPeak, John A. Melin, Gail M. Meyer, Gregory E. Meyer, John G. Meyer, Paul J. Meyer, J. C. Mickus, I. Keith Miller, Jerry K. Miller, Phillip L. Miller, Thomas C. Miller, Robert F. Modler, Lyn Cammarano Moodie, Emmet B. Moore, Jr., Edwin F. Morello, Barbara E. Moriarty, Wilbur N. Moulton, Mary H. Murai, Craig B. Murchison, Laurence A. Nafie, Joseph Nichols, Michael Nugent, Kenneth W. Nuorala, James A. O'Rourke, Martha J. Ohlson, Gary V. Olhoft, Eugene E. Olson, Peter C. Olson, Geneva M Omann, Joseph W. Opie, James H. Osborn, Thomas G. Ostertag, Dumas A. Otterson, Lyle G. Overholser, Janice Owens, Kenneth E. Owens, Constantine S. Papageorgiou, Rudolph Pariser, Lynda L. Parrella, Myron A. Parsons, Larry K. Pearson, Robyn M. Peck, Calvin L. Perry, James R. Persoon, G. W. Petersen, Douglas A. Peterson, Marvin L. Peterson, Sheri L. Peterson, Wayne A. Peterson, Dennis R. Pickering, Gary E. Pierce, George E. Plum, Joseph P. Porwoll, Curtis H. Pratt, James H. Prestegard, William W. Prichard, William F. Prigge, Michael J. Prokosch, John O. Punderson, Robert F. Raffauf, Floyd L. Ramp, Joel H. Rapaich, Harris J. Ratnayake, Alan W. Rautio, Anthony J. Razel, Thomas B. Reddy, George C. Reid, Stanley J. Remeneski, Edgar E. Renfrew, Malcolm M. Renfrew, Patricia A. Rethwill, Norman C. Reynolds, Jr., Aloyce J. Rholl, Steven C. Riemer, Mary C. Ritter, Donald N. Robinson, Thomas S. Robison, George F. Rodgers, Edgar R. Rogier, Paul E. Roof, Jerome J. Ross, James J. Rossbach, Charles J. Rostek, Jr., A. H. Runck, Indulis R. Rutks, Catherine E. Ryan, Rodney W. Salo, Gary L. Santee, Mark S. Schaberg, Paul F. Schacht, Jacob F. Schaefer, William H. Schaller, Cheryl A. Scholten, William P. Schrader, D. James Schreck, Joseph D. Schroeder, Everett M. Schultz, John L. Schultz, Kirby J. Scott, Richard M. Scribner, Russell D. Sehon, John L. Sheard, Daniel D. F. Shiao, Young-Tzung Shih, Sidney M. Shwartzfield, Gary B. Silberstein, Richard J. Sinn, William E. Skagerberg, Richard V. Soderberg, Quentin F. Soper, Jane B. Spence, Richard J. Sperley, Richard F. Sprecher, John A. Sramek, Thomas G. Stavros, Peter A. Steck, Mark A. Steine, Mr. and Mrs. Vernon A. Stenger, Robert E. Stevens, Joseph F. Stieber, Claire Zigmund Stokes, Catherine C. Stone, Roger W. Strassburg, Melvin P. Stulbergq, Richard J. Sundberg, Dale G. Swan, April J. Swanson, Glen L. Swanson, Todd A. Swanson, John J. Talley, Michael J. Tarlov, Kenneth J. Tauer, Lynne F. Taus, Paul E. Tavernier, Martin J. Tenenbaum, Roy W. H. Tess, Charles R. Thueson,

Steven J. Tinker, William A. Tisel, Joseph R. Tome, Charles A. Triplett, Francis W. Tuominen, Dale M. Ullevig, Gregg A. Vandesteeg, Kathryn M. Vogel, Richard E. Volkmann, Terence C. Wagenknecht, Mary J. Wahlstrom, Karen L. Wallace, Hsien Hau Wang, Victor K. Wang, Steven R. Wann, Roland D. Wardell, Joseph T. Warden, Jr., Vincent J. Webers, Edward O. Welke, Katherine L. Wells, Percy A. Wells, Jane I. Wenger, Peter J. Wepplo, Edward L. Wheeler, Larry D. Winter, Ronald G. Wohlfarth, Laura R. Wolszon, Hayward Y. Wong, Charles D. Wright, Ellen L. Wu, Carl D. Yaeger, Shang J. Yao, Mrs. Leng H. Yin, Lee R. Zehner, Patrick G. Zimmerman, Michelle M. Zirngible, and Janet L. Zuffa.

Memorial funds, established as fitting remembrance of faculty members and students associated with this department, are designated primarily for our undergraduate chemistry student awards program. Funds and donors in 1991-92 were: The Peteris Auzins Memorial Scholarship Fund: William C. O'Mara. The Robert C. Brasted Memorial Fund: George R. Glaros, Arthur K. Nelson, and Judson S. and Patricia B. Pond. The **Thomas P. Du Bruil Memorial Fund**: Ann C. Brey, Paul D. Brey, Thomas W. Du Bruil, and Francis and Theresa Haddy. The **John Overend Memorial Fund**: Kathleen A. Davis and Ronald O. Kagel.

The **Lloyd W. Goerke Fund**, which is dedicated to undergraduate scholarships, received a donation from Lloyd W. Goerke.

Industrial grants, frequently unrestricted, allow us to continue a number of essential programs, such as summer support for graduate students, matching funds for equipment proposals and summer pre-college minority laboratory experiences, and laboratory set-up contributions for new faculty. Unrestricted donations also allow for the provision of seed money for new initiatives. On occasion, industrial contributions are designated to support the research programs of specific faculty, or for special areas of interest, such as advanced materials research. Our thanks to the following companies and their educational foundations: Air Products, American Cyanamid, Amoco Foundation, Inc., Dow Chemical Company, General Mills, Hercules, Hewlett Packard, Procter & Gamble, Rohm and Haas Company, SmithKline Beecham, Union Carbide, and Warner-Lambert. Special industrial grants were received from Eastman Kodak for travel grants for chemistry graduate students to attend and present their work at national scientific meetings, from Merck Company to establish the Merck Lectureship in Chemistry, and from Monsanto to help underwrite the costs of 6th National Conference on Undergraduate Research.

Matching programs, with ratios varying from one-to-one to three-to-one, are offered by companies to stimulate giving on the part of their employees and have the added advantage of promoting consistency of corporate giving with public opinion. We thank these companies for their matches: Abbott Laboratories, Air Products & Chemicals, Alliant Techsystems, American Cyanamid, Amoco, AT&T, Atochem North America, B P America, Boeing, Bristol-Myers Squibb, Burlington Northern, Burroughs Welcome, Cardiac Pacemakers, Chrysler, Corning, Deluxe Corporation, Dow Chemical U.S.A., Ecolab, Eli Lilly and Company, General Electric, General Mills, H. B. Fuller Company, Hercules, Honeywell, Lyondell Petrochemical, Merck, Mobil, Montgomery Ward, Morton International, Nalco Chemical, NSP, Pfizer, Pittman-Moore, PPG Industries, Procter & Gamble, Rohm and Haas, Shell Oil, Sherwin-Williams, SmithKline Beecham, Sterling Winthrop, Tennant, Texaco, 3M, Times Mirror, Union Camp, Upjohn, Warner-Lambert, Wausau Insurance, and Whirlpool.

Ovations

During the past year, faculty and staff received honors and awards from sources both internal and external. We are justifiably pleased when others agree that our people are winners, and we are also pleased to relate their various accomplishments to you.

Professors **Doyle Britton** and **Treacy Woods** shared the Best Chemistry Professor award from the IT Student Board. Professor Woods was a member of our teaching staff during her sabbatical leave from Houston Baptist University, Houston, Texas.

Professor **Christopher J. Cramer**, who joined our faculty this fall (see "Transition State"), received a 1991 Arthur S. Flemming Award in the scientific category. This is a highly competitive award, open to civilian and military employees of the Executive Branch of the U.S. Government who are under the age of forty.

Regents' Professor **Paul G. Gassman** was elected Fellow of the American Academy of Arts and Sciences. He joins two of the department's Emeritus Professors in this elite group (see separate article on page 6).

Professor **Louis Pignolet** received one of three new, prestigious Institute of Technology Professorships. These were established to recognize distinguished faculty members within the institute who are judged to be exceptional through unusual efforts in, and contributions to, teaching, through their reputation in the scholarly field, and through a genuine commitment to the Institute of Technology and its activities.

Professor **Scott Rychnovsky** was selected as an Alfred P. Sloan Research Fellow. This two-year award, providing flexible research support, is extraordinarily competitive, involving nominations for the very best young scientists from around the country. Scott also received an Eli Lilly Research Award, which consists of research support for two years. Lilly's award is based solely upon nominations (no applications are solicited or accepted), and is thus a true barometer of peer appreciation.

Professor **William Tolman** was named a 1992 Searle Scholar. This is a prestigious program providing research support for the duration of the three-year award. Bill was also selected as one of ten University of Minnesota McKnight-Land Grant Professors. The McKnight program also offers research support for the two years of the professorship, along with teaching relief for one of the two years. Chemistry faculty have been consistently successful in this rigorous competition, and Bill continues that tradition.

The Institute of Technology's Civil Service Outstanding Service Award program this year honored **Dale R. Burling** (Electromechanical Systems Specialist) and **Karen Gilbert** (Lead Stores Clerk).

Chemistry Students Recognized

Graduate and undergraduate honors and awards are an integral part of our program at Minnesota. Such recognition provides our students with tangible indications of their achievements. We have many annual award programs administered by the department, and available to chemistry majors and advanced degree candidates. These are sponsored by our friends in industry or supported by memorial funds, and we thank the generous contributors who make them possible. We are pleased to pass along information on this year's student honors. Undergraduates are listed first, and graduate students second.

General Mills Scholarship, a $1,500 award sponsored by the Technology and Operations Division of General Mills, for a junior chemistry major: **Mark Aubart**. G. B. Heisig Undergraduate Research Fellowship–$1,500 fellowship awarded to advanced undergraduate students who have demonstrated outstanding achievement in undergraduate research in addition to overall scholastic excellence: **Mark Aubart** and **Daniel LeCloux**. Lloyd W. Goerke Scholarship–$1,000 awards to chemistry majors who have shown outstanding academic achievement and who have financial need: **Brant Kedrowski**. Robert C. Brasted Memorial Fellowship–$800 fellowship, as well as a part time apprenticeship in the department's general chemistry program, awarded to outstanding chemistry majors who have expressed an interest in a teaching career in chemistry: **Michael Nesler**. M. Cannon Sneed Scholarship–$600 award for chemistry majors who demonstrate great promise for future achievement: **Jeanette Stallons**. Chemistry Alumni and Faculty Scholarship–$500 award for a freshman chemistry major who has demonstrated outstanding academic achievement, funds donated by alumni of the department and by faculty: **Quyhn Anh Nguyen** and **Panna Dhond**. Thomas Du Bruil Undergraduate Research Award, a $100 prize for an undergraduate student who has demonstrated outstanding achievement in undergraduate research in chemistry at the sophomore or junior level: **Kathy Vidlock**. Eli Lilly Undergraduate Award, a $200 award for a sophomore or junior chemistry major who has an interest in a career in industry and who has shown outstanding academic achievement, made in the form of a check to the University Bookstores for the purchase of books and supplies: **Paul Fischer**. J. Lewis Maynard Memorial Prize in Advanced Inorganic Chemistry–$100 cash award for the purchase of books, given for outstanding scholastic achievement in advanced inorganic chemistry: **Robert Stavenger**. Walter M. Lauer Prize–$100 cash award for the purchase of books, for advanced undergraduate chemistry majors with distinguished academic records who have demonstrated strong interest in organic chemistry: **Edris Sahar**. CRC Freshman Chemistry Achievement Award sponsored by the CRC Press, Inc.–the latest CRC Handbook of Chemistry and Physics, given to freshman chemistry majors for outstanding achievement in freshman chemistry: **Quyhn Anh Nguyen**. Merck Index Award sponsored by Merck & Co., Inc.–latest edition of the Merck Index, given to sophomore chemistry majors for outstanding scholastic achievement in organic chemistry: **Brant Kedrowski**. Undergraduate Award in Analytical Chemistry, sponsored by the Division of Analytical Chemistry of the American Chemical Society–a year's subscription to the journal *Analytical Chemistry*, given for outstanding scholastic achievement in analytical chemistry: **Annette Trowbridge**.

Other undergraduate students succeeded in competition for external awards. **Annette Trowbridge** was selected for science aptitude and promise in research with award of the 1992 Sigma Xi Thomas F. Andrews Prize. **Bijan Mossedeghi** won the 1992 Sigma Xi George T. Walker Prize based upon the same criteria. These are both cash prizes of $150, sponsored by Sigma Xi, the scientific research society. **Annette Trowbridge** was also honored with an American Institute of Chemists Foundation Award, which is based on ability, character, scholastic achievement and potential advancement in the chemical professions.

Among our graduate students, the outstanding TA of the year, recognized by the Robert L. Ferm Memorial Award, was teaching assistant **Bruce Rogers**. This award is sponsored by Pillsbury, and its parent company, Grand Metropolitan PLC, and consists of a cash prize. In the words of a senior research chemist at Pillsbury who participated in the award ceremony, Bruce was "recognized by students who write urgently of teaching skills too easily overlooked, too quickly forgotten: preparation, expectations, enthusiasm, lab safety, chemical knowledge and patience."

Graduate students holding academic year corporate fellowships were: **Christine Eastman**–Amoco; **Jianjun Li**–3M; **Vasilios Melissas**–Rohm and Haas; **Donald Skalitzky**–Du Pont; and **Joseph Suriano**–BASF. The Elmore Northey Fellow was **Sean Casey**, and **Michael Hill** was awarded the Stanwood Johnston Fellowship, which is administered by the Graduate School. Graduate School Dissertation Fellowships were held by **Paul Hanson** and **Roseann Kroeker**. **Marc Ferrer** held a Fulbright Fellowship.

Kim Paulson received the Iota Sigma Award for Outstanding Graduate Student. On the occasion of her award presentation, held at the College of St. Catherine in St. Paul, she spoke on *"EPR Spectroelectroscopy of the Hydroxylase Component of the Methane Monoxygenase System."*

Congratulations to all of our fine students!

Recent Department of Chemistry Graduates

Congratulations to our recent degree recipients, who were granted their degrees during the period from July 1, 1991 to June 30, 1992. Columns reading from left to right are name of graduate, research advisor, thesis title and current place of employment.

PH.D. DEGREES

Abraham, Timothy Walter	Leete	*"Part 1. New Intermediates in the Biosynthesis of the Tropane Alkaloids in* Solanaceae. *Part 2. Studies on the Biosynthesis of the 1, 4-Benzoxazin-3-ones in* Zea Mays*"*	Postdoctoral, Univ. of Minnesota, Dept. of Medicinal Chemistry, Minneapolis, MN
Ahn, Seichang	Hoye	*"Studies Toward the Total Synthesis of the Venturicidin Aglycone"*	Postdoctoral, Harvard Univ., Dept. of Chemistry, Cambridge, MA
Amarasingha, Sudath Dha	Evans	*"An Alternating Current Impedance Study of Poly(4-vinylpyridine) Coated Platinum Electrodes"*	Postdoctoral, Univ. of Iowa, Dept. of Chemistry, Iowa City, IA
Bergold, Alan Frederick	Carr	*"High Performance Lectin Affinity Chromatography: An Examination of the Thermodynamic and Kinetic Limitations of the Technique and the Development of an Alternative Elution Method"*	Research position, Univ. of Iowa, Protein Structure Facility, Iowa City, IA
Brennan, Bridget Anne	Que	*"Physical Characterization of Diiron-Dioxygen Complexes and Resonance Raman Studies of Mononuclear Non-Heme Iron Proteins"*	Du Pont, Wilmington, DE
Chatfield, David Charles	Truhlar	*"Quantized Transition State Control of Chemical Reactivity"*	NIH, Division of Computer Research & Technology, Bethesda, MD
Chen, Ke Jian	Hoye	*"I. Fischer Carbene Complexes: Cyclizations with Alkenyl Alkynyl Ethers and Preparation from Alkyl Iodides. II.. Radical Cyclizations of Allyl, Propagyl, and Cyclopropylmethyl Iodides"*	3M Company, St. Paul, MN
Chyall, Leonard Jesse	Gassman	*"The Synthesis and Thermal Rearrangements of 7, 7-Dibromo-trans-bicyclo[4.1.0]hept-3-ene and 7,7-Dichloro-trans-bicyclo[4.1.0]hept-3-ene"*	Postdoctoral, Purdue Univ., Dept. of Chemistry, West Lafayette, IN
Day, Paul Norman	Truhlar	*"The Calculation of Chemical Rate Coefficients by Quantum Mechanical Flux Autocorrelation Functions and the Calculation of Vibrational Energy Levels of Highly Excited Molecules with a Multi-Arrangement Basis"*	Postdoctoral, Iowa State Univ., Chemistry Dept., Ames, IA
DeSilva, Saliya Anil	Gassman	*"Use of Sterically Hindered Sensitizers for Improved Photoinduced Electron Transfer Reactions"*	Assistant Professor, Montclaire State College, Dept. of Chemistry, Upper Montclaire, NJ
Dinsmore, Christopher John	Hoye	*"Metal-Catalyzed Intramolecular Cyclization Reactions of Alkynyl Alpha Diazoketones: Mechanistic and Synthetic Studies"*	Postdoctoral, Dept. of Chemistry, Harvard Univ., Cambridge, MA
Friesen, John Brent	Leete	*"The Biosynthesis and Metabolism of Pyridine Alkaloids in* Nicotiana*: Nicotine Demethylase and Nicotine Synthase"*	Programme des Nations Unies pour le Developpement, N'Djamena, Chad
Harring, Scott Richard	Livinghouse	*"Improved Reagents for Episulfonium Ion and Lewis Acid Mediated Cationic Cascade Annulations. Applications to Natural Product Synthesis"*	Not available
Huang, Kin-Shan	Etter	*"Hydrogen-Bonded Nitroaniline Aggregates: Design, Preparation, Characterization, and Application to Nonlinear Optical Materials"*	Postdoctoral, Dept. of Medicinal Chemistry and Pharmacognosy, Purdue Univ., West Lafayette, IN
Hwang, Jenwei	Gladfelter	*"New Precursors for Aluminum and Gallium Containing Solid State Materials"*	Not available
Jensen, Michael Dennis	Livinghouse	*"Carbocycle and Heterocycle Annulations Mediated by Group IV Transition Metal Complexes"*	Dept. of Chemistry, Purdue Univ., West Lafayette, IN
Johnson, Kimberly Ann	Gladfelter	*"Synthesis and Reactivity of an Electron Rich Ruthenium (0) Dimer"*	Shell Oil, Houston, TX
Kim, Yongho	Kreevoy	*"Dynamics of Hydride Transfer in Solution Using Variational Transition State Theory"*	Dept. of Chemistry , Univ. of California, Berkeley, CA
Kwan, Wing Sum Vincent	L. Miller	*"The Studies of Thiol-Terminated Olioimide Rods on Gold"*	Postdoctoral, Univ. of Illinois at Urbana-Champaign, IL
Ma, Zhiliu	Gentry	*"Crossed Beam Studies of State-to-State Energy Transfer in Glyoxal and Iodine"*	Argonne National Labs, Chemistry Division, Argonne, IL
Mickelson, John Warren	Gassman	*"The Synthesis of Polytrifluoromethylated Cyclopentadienes and Indenes and their Use as Transition Metal Ligands"*	Postdoctoral, Upjohn Co., Kalamazoo, MI
Parasuk, Vudhichai	Almlöf	*"Electronic and Molecular Structures of Medium-Sized Carbon Clusters"*	Assistant Professor, Chulalongkorn Univ., Bangkok, Thailand
Rak, Stanton Foster	L. Miller	*"Synthesis and Spectral Property Studies of Mixed-Valence Polyacene Imide and Quinone Anion Radicals"*	Motorola, Inc., Chicago, IL
Reutzel, Susan Marie	Etter	*"Hydrogen-Bonded Imide Aggregates: Solid-State Design, Preparation, and Characterization by Solid-State NMR"*	Eli Lilly & Co., Indianapolis, IN
Rotstein, Nestor Adrian	Lodge	*"Dynamics of Entangled Polymer Systems"*	Monsanto, Springfield, MA
Russell, Raymond Nathan	Liu	*"I. Stereochemical and Mechanistic Studies of the Biosynthesis of CDP-Ascarylose . II. Purification of a Lipid Inhibitor of Lymphoid Cell Growth from Macrophage Hybridoma Cells"*	Chemical Abstracts, Columbus, OH
Sahouani, Hassan	Lodge	*"Effect of Solvent Quality on the Relaxation of a Single Polymer Chain"*	3M Company, Consumer Video & Audio, St. Paul, MN
Schulze, Roland Kim	Evans	*"Ion Yield Variations in Sims and ESD of Covalently Modified Surfaces Upon Surface Work Function Alterations by Alkali Metal Adsorption"*	Los Alamos National Labs, Los Alamos, NM
Stallman, Barbara J.	L. Miller	*"Synthesis and Properties of Oligoimides"*	Faculty position, Mary-Manse College, Toledo, OH

Walker, Gilbert Creighton	Barbara	*"Solvation Dynamics and Vibrational Excitations in Electron Transfer Reactions"*	Postdoctoral, Univ. of Pennsylvania, Philadelphia, PA
Weber, Thomas Philip	Carr	*"The Development and Characterization of High Performance Liquid Chromatographic Supports Based on High Temperature Modified Porous Zirconia Micro-Spheres"*	3M Company, Pharmaceuticals, St. Paul, MN
Witowski, Nancy Elann	Hoye	*"I. Metal Ion Binding Capacity as a Function of the Stereochemistry of Stereoregular 2,5-Linked Oligotetrahydrofurans. II. Omega-Phenylalkylsilylethers as Proton NMR Spectroscopic Probes for Long Chain Alkanols"*	Dowbrands, Inc., Fridley, MN
Yang, Dingyah	Liu	*"I. Mechanistic Studies of Biosynthesis of 3,6-Dideoxyhexoses. II. Studies of the Mechanistic Diversity of Sodium Cyanoborohydride Reduction of Tosylhydrazones and Oxidation of Tosylhydrazines by N-Iodosuccinimide."*	Postdoctoral, Dept. of Chemistry, Cornell Univ., Ithaca, NY
Zhu, Xiaoxiang	W. Miller	*"Surfactant Fluid Microstructure and Surfactant Aided Spreading"*	Postdoctoral, Dept. of Chemical Engineering, Univ. of Minnesota, Minneapolis, MN
MASTER'S DEGREES			
Arriola, Mark	Raftery	*Plan A*	Pfizer, Molecular Genetics & Protein Chemistry, Groton, CT
Brooks, Ann Marie	Leete	*"Studies Involving the Alkaloids of* Dendrobium Pierardii*"*	Abbott Labs, Chicago, IL
Cicero, Andrea Marie	Etter	*"Studies in Hydrogen Bond Topology Using Alcohols and Nitroanilines as Model Systems"*	General Mills, Golden Valley, MN
Fu, Irong	Bowers	*"Micro-Quantitation of Cyclosporine and its Metabolites and Determination of their Spectral Absorptivities"*	Not available
Humble, Michael Carl	Raftery	*"Binding Site Studies of the Nicotinic Acetylcholine Receptor"*	North Carolina School of Science & Math, Durham, NC
Jones-Humble, Stacey Ann	Raftery	*"Biochemical Studies of the Ionic Channel of the* Torpedo Californica *Nicotinic Acetylcholine Receptor"*	Burroughs Wellcome Co, Pharmacology Dept, Research Triangle Park, NC
McNicholas, Susan L.	Que	*Plan B*	Not available
Ochs, Karl Conrad II	Pignolet	*"Kinetics of Ligand Exchange Reactions of Tertiary Phosphites with an Iridium-Gold Cluster and of 2, 6-Dimethylphenylisonitrile with a Platinum-Gold Cluster as Measured by ^{31}P NMR"*	Not available
Onyenemezu, Clement Nnamdi	W. Miller	*"Emulsifier-Free Polymer Latexes: Styrene with an Ionic Comonomer"*	PhD candidate, Dept. of Chemistry, Univ. of Minnesota, Minneapolis, MN
Parker, Diana Lee	Etter	*"The Solid-State Chemistry and Hydrogen-Bond Properties of Cyclic b-diketomethanes. Incidence and Application of Hydrogen-Bonded Cocrystals in Organic Solid-State Chemistry"*	College of Wooster, Dept. of Chemistry
Paulsen, Kim Elayne	Stankovich	*"Electron Transfer Properties of Flavodoxine from* Anabaena 7120 *and Mammalian Electron Transfer Flavoprotein Ubiquinome Oxidoreductase"*	PhD candidate, Dept. of Chemistry, Univ. of Minnesota, Minneapolis, MN
Wei, Michael	Gladfelter	*"Mechanistic Studies of Organometallic Chemical Vapor Deposition of Metal Thin Films"*	National Ink, Nashville, TN
Won, Jongok	Lodge	*"Tracer Diffusion of Star Polymers"*	PhD candidate, Dept. of Chemistry, Univ. of Minnesota, Minneapolis, MN
Yu, Zhengtian	Almlöf	*"Jahn-Teller Effect of Ni_6"*	Graduate Student, Dept. of Chemistry, Univ. of Massachusetts, Amherst, MA

BACHELOR'S DEGREES with a major in chemistry were granted during this same period to:

Grant Anderson, Brad Backes, Raphael Dean Bartz, Darin DuMez, Joel Andre Fischer, Michael Flowers, Judi Heisinger, Troy Holland, Ky Johnson, Sutjano Jusuf, Gregory Joseph Kampa, Mary Margaret Kappes, Hideki Kawai, Kristin Kishel, Laurie Kleinbaum, Wayde Konze, Laura Kruckeberg, Richard Kubik, Jeffrey Lesmeister, Anastasia Lay Lim, Karen Lushine, Kelli Jo Martin, Patricia McNally, Brian Nelson, James O'Brien, Maria Roemhildt, Peter Alwin Schulze, John Michael Sorenson, David Swanson, Phi Hung Tran, Annette Trowbridge, Edward "Ted" Ulrich, Cheng Vang, Ryan Patrick Wagner, Dawn Kveton Witherill, and Kurt Zabel

If you wish to make a donation to chemistry, please send your donation to the attention of the Chair, Department of Chemistry, 139 Smith Hall, 207 Pleasant Street Southeast, University of Minnesota, Minneapolis, Minnesota 55455. You may also use the donor forms and envelopes provided by the University of Minnesota Foundation Office. You may specify that your gift be used wherever needed, or you may designate it for a particular purpose.

Margaret C. Etter, September 12, 1943–June 10, 1992
(Obituary appears in "Transition State" on page 4)

Edward Leete, April 18, 1928–February 8, 1992 (Obituary appears in "Transition State" on page 4)

The University of Minnesota is an equal opportunity educator and employer.

Minnesota Chemists Newsletter
Department of Chemistry
139 Smith Hall
207 Pleasant Street S.E.
University of Minnesota
Minneapolis, MN 55455

NONPROFIT ORG.
U.S. POSTAGE
PAID
PERMIT NO. 155
MINNEAPOLIS, MN.

Address Correction Requested