Chemistry and Chemical Biology

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The Chairman's Notebook

The past few months have been a time of rapid change and careful planning for our department. The changes include the creation of a new endowed chair, the addition of new faculty and graduate students, and the receipt of new awards. The planning concerns a possible new building.

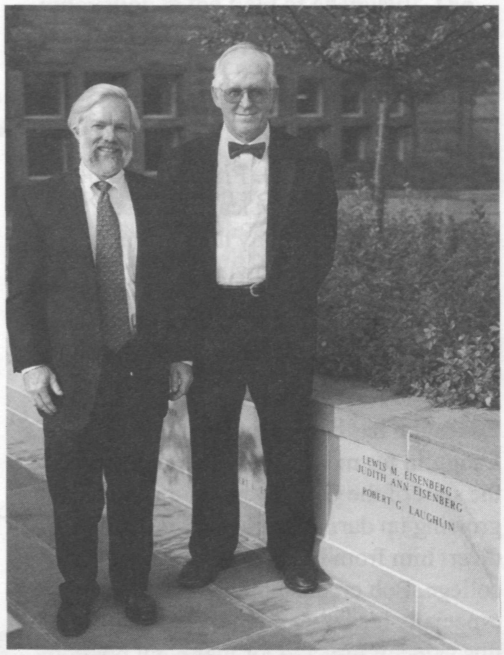
The university, college, and department are delighted at the creation of the Frank and Robert Laughlin Chair of Physical Chemistry, donated by Robert Laughlin. Dr. Laughlin obtained his Ph.D. at Cornell under the direction of A. T. Blomquist in 1956 and has worked at Procter & Gamble for more than 40 years. The chair is intended to rejuvenate experimental phase science, an important subdiscipline in the field of physical chemistry, and to continue the pioneering sprit that has been a tradition at Cornell for 100 years. More information on the dedication is included in the article on page 2.

I am very pleased to announce that John Marohn has joined our faculty as an assistant professor. John earned undergraduate degrees in physics and chemistry from the University of Rochester as well as a Ph.D. from the California Institute of Technology, where he worked with Dan Weitekamp. Most recently he has been a National Research Council postdoctoral associate with Dr. Doran Smith at the U.S. Army Research Laboratory and the University of Maryland. His area of research is magnetic resonance and electric force microscopy.

For the second year in a row we have attracted a large and talented class of graduate students: 39 were enrolled this year, and most are already in residence for the teaching assistant training program. We look forward to their research and teaching contributions. Good students, at both the graduate and undergraduate levels, are our most important asset.

Our faculty and students have won many prizes during the first part of this calendar year; you will find articles about some of them in this issue of the newsletter. Let me draw your attention to just a few. Graduate student Doug Weibel was selected for a Stephen and Margery Russell Distinguished Teaching Award. Professor Bruce Ganem was also honored for his teaching by the receipt of the Chemical Manufacturers Association National Catalyst Award. Several faculty members have been honored for their research contributions: Professor Benjamin Widom received a doctor honoris caussa degree in Chemistry from the University of Utrecht and won the ACS Award in Theoretical Chemistry. Professor Peter Wolczanski was elected to the American Academy of Arts and Sciences and won the Casimir Funk Natural Science Award of the Polish Institute of Arts and Sciences of America. Professor Barry Carpenter won the James Flack Norris Award in Physical Organic Chemistry sponsored by the Northeastern Section, ACS. Professor Harold Scheraga received the ACS Ralph F. Hirschmann Award in Peptide Chemistry. Professor Geoff Coates was awarded a Sloan Fellowship.

It is exciting to begin the planning stages for the possible construction of a new chemistry building to accommodate our expansion into the area of chemical biology. Two key scientists, Steve Ealick and Rick Cerione, have moved to our department from elsewhere at Cornell, and we have received the support and encouragement of the Cornell administration to hire up to five new faculty in the area of chemical biology over a five-year period. These seven positions, along with the net addition of two positions in more traditional areas of chemistry, mean that we have begun an expansion from a faculty size of 28 in 1998 to one of 37 over a five-year period. This growth of the department faculty, as well as the new facilities needed to ensure that Cornell will become a leader in the field of chemical biology, demand that we



Paul Houston and Robert Laughlin stand next to the newly inscribed donor wall

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both renovate unsuitable space in Baker Laboratory in the short term and plan for a new building in the long term. We have recently begun the formal planning process that will lead to selection of architects and a building site.

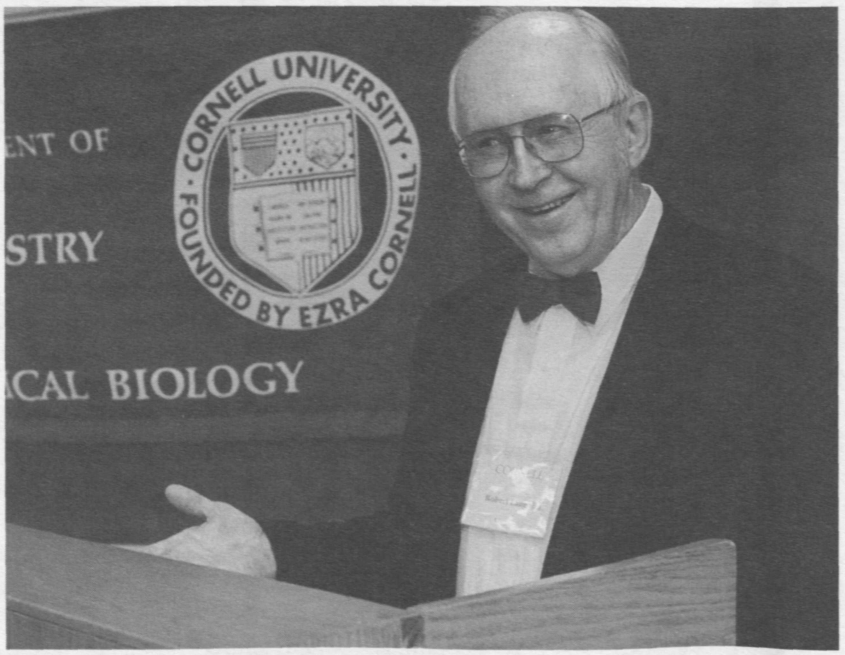
We note with sadness the death of Frank Long, who not only led our department as chairman in the 1950s but also served Cornell as vice president for research and advanced studies and served the country under three administrations as a member of the President's Science Advisory Committee (see *In Memoriam* on page 4). A conference commemorating Long's contributions to the university and particularly to Cornell's program in Science, Technology and Society will be held on October 2.

Professorships

Frank and Robert Laughlin Chair of Physical Chemistry

On Friday, July 16, the Frank and Robert Laughlin Chair of Physical Chemistry was dedicated in a ceremony held in Baker Laboratory. The following is adapted from the dedication program:

Robert G. Laughlin, PhD '55



Robert Laughlin

Education has been important to Robert Laughlin for most of his life. Being born at the start of the Great Depression and growing up during World War II did not divert him from his interest in going to college. Bob credits both his parents but especially his father, Frank, with instilling this value in him and for making it possible for him to receive an excellent education. His father was educated at the Indiana State Normal School (now Indiana State University) and taught high school history and social studies. He was a primary inspiration for Bob's decision to name the chair he is endowing, "the Frank and Robert Laughlin Professorship of Physical Chemistry."

Bob strove to emulate his intelligent, even-tempered parent, who managed to put three children through college during the 1940s on a high school teacher's salary and income from a small farm. But it was Frank's approach to building fences on the farm that taught Bob, by example, that he could achieve large goals if he broke a job down into manageable tasks and then worked hard at it. During the decade of World War I, Frank built his own father a hip-roofed barn that was innovative for its time. The barn was still standing 50 years later. In 1927 he built the family's home in Bloomfield, Indiana, a poured concrete basement structure that was far ahead of the midwestern architecture of the time. Frank was highly respected as a high school teacher and within his family.

That remarkable diligence and innovative intellect also distinguish Robert Laughlin, who is philosophical about his 43-year career with Procter & Gamble that brought him international renown as a research scientist. He believes in the importance of balancing stability and diversity and is satisfied that his work as a chemist with Procter & Gamble enabled him to achieve this. "I've had the stability of being with the same company for a long time and the opportunity to work on a great diversity of research," he says.

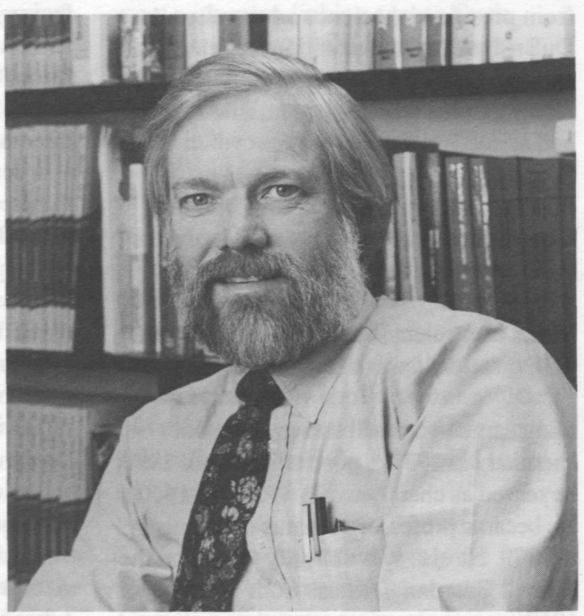
Robert Laughlin earned his bachelor of science in chemistry from Purdue University in 1951 and his Ph.D. in organic chemistry under A. T. Blomquist at Cornell in 1955. In 1956, he spent one year as a postdoctoral student of Professor William von E. Doering of Yale University in physical organic chemistry to round out his education. That July he began working for Procter & Gamble. His education continued on an informal basis while an employee of Procter & Gamble, and during the 1970s and 1980s his research shifted from organic chemistry to phase science and physical chemistry. He will retire from Procter & Gamble on October 8, 1999.

Robert Laughlin's area of specialization is the physical science of surfactants, the earliest known examples of which are soaps. His work has covered all aspects of their science—synthesis, solution physical chemistry, phase behavior, colloid science, and biological science—and also the application of this science to the development of numerous surfactant-containing technologies. Some of the well-known household products to which his research has contributed are Clorox bleach, Dawn liquid dishwashing detergent, Pert Plus shampoo/conditioner, and Downy fabric softener. Robert holds 26 patents, publishes extensively, and speaks at conferences around the world. His 1994 book, *The Aqueous Phase Behavior of Surfactants*, has been so well received in academic and industrial circles that it is in its second printing. The book, a "huge job" as Robert describes it, is dedicated to his father, whose systematic and analytic approach to work inspired the author's approach to writing the book.

The Frank and Robert Laughlin Chair of Physical Chemistry is intended to to rejuvenate experimental phase science, an important subdiscipline of the field of physical chemistry, and to continue the pioneering spirit that has been a tradition at Cornell for 100 years. At the turn of the twentieth century, Cornell was one of two universities in the country with a professorship in physical chemistry. The university achieved preeminence in this then new field through the work and dedication of faculty members, the best known of whom was Wilder D. Bancroft. Bancroft kept Cornell on the cutting edge by doing research in phase physical chemistry and colloid science, founding the *Journal of Physical Chemistry*, actively participating in the American Chemical Society (including serving as its president), sponsoring the Gibbs Medal, and developing new courses and strengthening the curriculum, especially in the area of applied science. Bancroft was a controversial professor toward the end of his career, but there is no doubt that his book, *The Phase Rule*, published in 1897, had a profound and positive influence on the ensuing explosive development of phase science. This area of research preoccupied a great many chemists during the first half of the twentieth century, and it is generally recognized that Bancroft's work spawned major developments, especially in geology, ceramics, and metallurgy. Phase science has also been critically important to the development of modern surfactant-based technologies. It is no less important now than it was then.

According to Robert Laughlin, just as Cornell was an excellent university at which he could pursue graduate studies, it is the right place for him to endow a professorship in physical chemistry. He is impressed with many faculty members at Cornell in phase science, notably Benjamin Widom, who has enabled Cornell to maintain its reputation for innovation in the field of chemistry. The Laughlin Professorship pays tribute to the department's past accomplishments. It will extend and further develop this important scientific discipline and, in time, contribute significantly to sustaining Cornell's position as the focal point of strength in phase science by producing graduates who will be well trained in the field. In doing so, it should serve as a catalyst for vital new collaborative research between industry and academia.

The Peter J. W. Debye Professorship



Paul L. Houston, professor of chemistry and chemical biology and chair of the Department of Chemistry and Chemical Biology, has been elected the Peter J. W. Debye Professor of Chemistry.

The professorship was established in 1994 through the gift of an anonymous donor and honors Nobel laureate and theoretical physical chemist Peter J. W. Debye, a Cornell faculty member who served as an eminent teacher and scholar at the university from 1939 until his death in 1966.

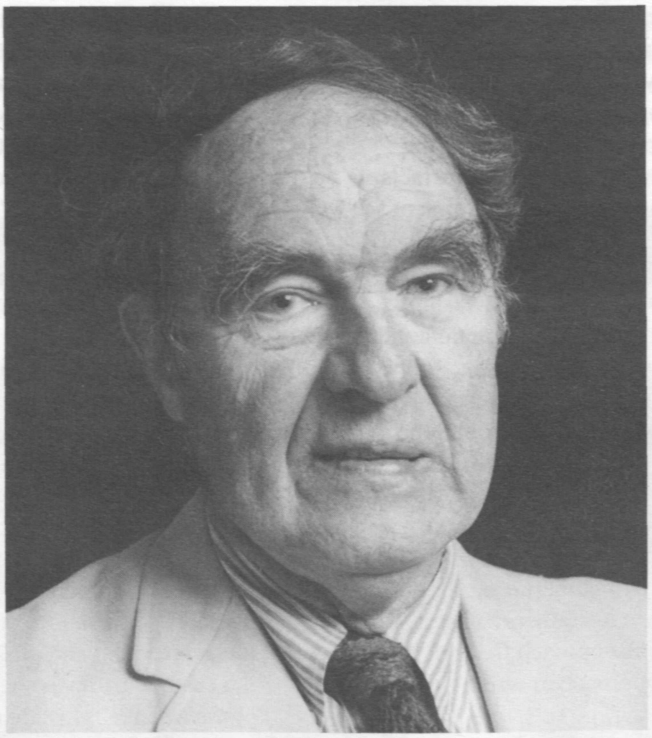
Houston is an experimental physical chemist who has forged an international reputation in the field of laser spectroscopy. Much of his research has involved the study of photodissociation dynamics, dynamics of molecules on solid surfaces, and collisional energy transfer.

He graduated from Yale University in 1969 with a B.S. in chemistry and from the Massachusetts Institute of Technology in 1973 with a Ph.D. in chemistry. From 1973 to 1975, he was a postdoctoral fellow at the University of California–Berkeley. He came to Cornell in 1975 as an assistant professor of chemistry, rising to full professor in 1985. He was named department chair in 1997.

Houston is a fellow of the American Physical Society and was senior editor of the *Journal of Physical Chemistry* from 1991 to 1997.

In Memoriam: Franklin A. Long

Franklin A. Long, professor emeritus of chemistry at Cornell and the university's vice president for research and advanced studies from 1963 to 1969, died in Pomona, Calif., Monday, February 8. He was 88.



Long achieved national prominence in 1969 when he was nominated as director of the National Science Foundation (NSF). But the appointment was blocked by President Richard Nixon because of Long's stated opposition to the antiballistic missile system (ABM), then a highly controversial element of U.S. nuclear defense strategy.

At the time of Long's conflict with the Nixon administration, he had behind him a long career as a Cornell faculty member and administrator and as a U.S. government science adviser. He was a member of the President's Science Advisory Committee, serving under presidents Eisenhower, Kennedy and Johnson.

In 1968, writing in the *Bulletin of Atomic Scientists,* he had criticized the government's development of the ABM system on the grounds that it would generate "strong pressure toward acceleration of the arms race."

Thus when Long's name was put forward as the next director of the NSF, the ground was prepared for a conflict with the administration. Long recalled at the time that he went to Washington for an appointment with Nixon and there learned from presidential science adviser Lee A. DuBridge that "the situation had changed and that new elements of a political nature relating to the antiballistic missile system had arisen."

Following the administration's blocking of Long's appointment, many distinguished scientists came to his support.

Nixon later relented and offered Long the NSF directorship, but Long rejected it.

Long came to Cornell as a professor of chemistry in 1937, a post he held until 1979; he served as chair between 1950 and 1960. He became professor emeritus of chemistry in 1979. He also was a faculty trustee on the Cornell Board of Trustees from 1956 to 1957.

His deep concern for issues of scientific responsibility and his opposition to the arms race were evident in both his academic and professional appointments. In 1969 he began a four-year tenure as director of a new Cornell academic and research program, Science, Technology and Society, designed to study the impact of science and technology on the problems facing U.S. society. Between 1969 and 1979 he held the Cornell post of Henry R. Luce Professor of Science and Society, and between 1976 and 1979 he was director of the Peace Studies Program. He also served on the boards of the *Bulletin for Atomic Scientists,* the Albert Einstein Peace Prize Foundation, and the Fund for Peace. He was active in the international Pugwash movement.

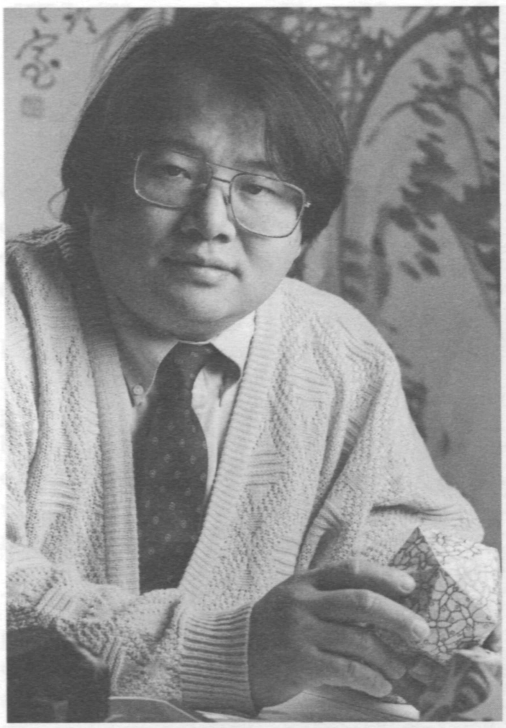
Long's government service began in 1942, when he worked as an explosives supervisor for the National Defense Research Committee. He later became a ballistics consultant for the U.S. Army, chairman of the Chemistry Advisory Committee for the U.S. Air Force, and a member of the Air Force's Science Advisory Board. Between 1962 and 1963 he was assistant director for science and technology of the U.S. Arms Control and Disarmament Agency, for which he also served as a consultant from 1977 to 1979.

In 1948 he was awarded the U.S. Medal of Merit, and in 1975 he received the Order of Civil Merit and the Dongbaeg Medal from the president of the Republic of Korea for his contributions to the development of science and technology in South Korea. In 1989 he was awarded the American Association for the Advancement of Science Philip Hauge Ableson Prize.

Long's wife, Marion, died in 1992. He is survived by a son, Franklin, a chemist, of Claremont, Calif., and a daughter, Elizabeth, a professor of sociology at Rice University.

Long Symposium Planned

A symposium in memory of Professor Franklin A. Long is scheduled for October 1 and 2, 1999. The two-day symposium, entitled "The Great ABM Debate—Then and Now," will feature many prominent speakers from both inside and outside Cornell University.



Chemist Stephen Lee is Exploring New Building Blocks to the Future

By David Brand, Cornell News Service

Stephen Lee is seeking materials that some say can't exist, but if they did would have extraordinary properties. They would be crystal structures that could bind to any specific molecule, whether it be a metal or a gas.

"One of my colleagues mentioned that if you could just make a site that would bind to gold preferentially to other ions, you could separate out gold in seawater," he says.

More feasibly, Lee is looking for materials that would seek out and remove organic compounds, including such hazardous chemicals as dioxins and biphenyls, or would be able to hold catalytically active metals such as palladium and silver. But, Lee confesses, "many people still think this is hopeless."

Lee recently came to the department as a professor of solid state chemistry from the University of Michigan, where he had been associate professor of chemistry since 1993 and where he was a both a MacArthur and a Sloan fellow. It is something of a homecoming for Lee: He was a visiting scientist at Cornell in 1995.

Until four years ago, Lee's background was entirely in solid state chemistry, but he became interested in the field of organic—carbon-based—building blocks and began investigating how such molecular units are packed together. One potential advantage of organic molecules is that the researcher has much more control of both size and shape than with their inorganic counterparts. If a way could be found to construct an organic porous solid, Lee reasons, it could be tailored to a great number of industrial uses. Its pores, for example, could be fashioned into the size and shape of a specific molecule. The problem was, and is, that it has never been done.

Industry makes wide use of inorganic porous solids, called zeolites, for catalysis, separation, and storage. Just one example is their use in separation of petroleum feedstocks. The big problem with these inorganic solids, says Lee, is that the porosity can't be manipulated for specific uses. Organic molecules, because of their greater diversity, would give researchers many more tools in the control of their flow. Lee uses the example of trying to channel water from a high elevation to a lower one. The intention is to build a channel that will guide the water in a controlled flow.

The problem in making an organic porous solid is that it hasn't yet been produced as a stable crystal. Inorganic zeolites, by contrast, are as stable as glass. Current organic porous solids still dissolve in a fair number of solvents.

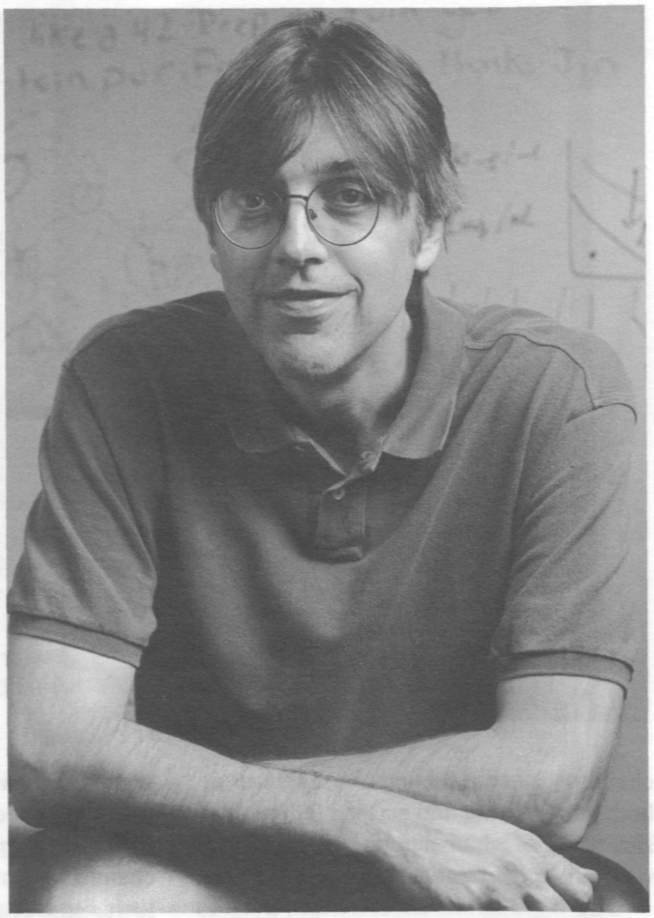
In his lab, Lee's research team is following a two-step approach. In the first step, researchers D. Venkataraman and Geoffrey Gardner, together with Jeffrey Moore's research group at the University of Illinois, linked together organic molecules containing benzene rings with silver ions and benzene itself. When the benzene was heated and boiled off, uniform-size pores were left. These pores, however, are still not sufficiently stable for many applications. The problem is that the links of the silver to the organic molecule are too weak to hold up to many applications. Says Lee, "It's like people making a chain by holding hands: if one person loses a grip, the chain is broken and the network falls apart."

Now Lee and graduate students Yuan-Hon Kiang and Zhengtao Xu are taking the second step by adding alcohol molecules to the initial organic molecule. These alcohol molecules can be used to react with cross-linking agents. Such agents are widely used in polymers to make the material more rigid and more stable. Lee's group hopes to see the same effect in the new porous materials.

"This is only the first generation. By the second or third generation we hope to be able to generate the first truly robust porous organic solid," he says. "If you can really succeed in making organic solids stable enough to do reactions in, I see no reason why applications shouldn't be at least as big as with current inorganic solids. And potentially you would have much more control."

Lee's work is supported by a grant from the National Science Foundation and by Cornell's ambitious materials research program, which drew him to the campus in the first place.

Rick Cerione



Richard A. Cerione, a native of Vineland, N.J., began as a chemical engineering student in the College of Engineering at Rutgers but switched to biochemistry in his senior year because of a growing interest in the structure and function of macromolecules. He continued at Rutgers as a biochemistry graduate student, studying general mechanisms of enzyme catalysis, and extended this work as a postdoctoral fellow with Gordon Hammes in the chemistry department at Cornell. At Cornell, his research interests came under the influence of the late Efraim Racker and began to shift toward more biomedical research questions. This caused him to join Robert Lefkowitz at the Howard Hughes Medical Institute at Duke Medical School to work toward the reconstitution of hormone receptor–coupled signal transduction pathways. There he was able to successfully reconstitute the beta-adrenergic receptor–coupled adenylyl cyclase system in liposomes, using purified protein components.

Cerione then joined the faculty in the Department of Pharmacology in the College of Veterinary Medicine at Cornell, where he was selected as a PEW biomedical research scholar. Over the past 13 years, Cerione has graduated a number of Ph.D. students in biochemistry and pharmacology and has been involved in teaching undergraduate, graduate, and veterinary students. He has offered a long-running graduate course covering the molecular mechanisms of signal transduction and has continued his work in this area, using biochemical and genetic approaches, and more recently, combining this with structural studies using X-Ray crystallography. In particular, Cerione has been interested in identifying new signaling molecules that provide the regulatory cues for mammalian cell growth, differentiation, and apoptosis.

At present, three main areas are being pursued in Cerione's laboratory. The first involves studies of the regulation and structural characterization of a small, single-chain GTP-binding protein, Cdc42, that was discovered by members of the laboratory some years ago and has since been shown to play critical roles in cell growth and in the establishment of cell polarity and cytokinesis. Efforts are being directed toward identifying the cellular regulators and targets of this important GTP-binding protein and understanding their interactions in molecular detail through X-ray crystallography. A second area of interest focuses on comparing the molecular regulation of Cdc42 with the regulation that underlies other larger GTP-binding proteins, such as transducin, a heterotrimeric GTP-binding protein that is essential for normal vision. The third area of emphasis is the discovery and characterization of new signaling molecules in the nucleus, which influence the processing of RNA and are essential in determining cell fate (i.e., whether cells differentiate or undergo programmed cell death).

Recently, Cerione has become a member of the Department of Chemistry and Chemical Biology. The goal is to take advantage of the existing strengths in the department, particularly in the areas of small molecule chemistry and structural biology, to generate new tools for studying mammalian cell growth and for intervening against disease states such as cancer. Cerione will have active research programs, both in the Department of Molecular Medicine at the Veterinary College and in Chemistry and Chemical Biology. The research group at the Veterinary College will lead basic research efforts within the newly developed Animal Cancer Center to assess the importance of newly discovered signaling molecules in different animal model systems for human cancer. The laboratory in Chemistry and Chemical Biology will perform structure-function characterizations of these signaling molecules and study the molecular basis by which they function, combining fluorescence spectroscopic and X-ray crystallographic approaches. The hope is that this will provide a model for integrating the strengths from the physical and chemical sciences at Cornell with those in biology and clinical veterinary medicine.

CU Chemist Geoffrey Coates Reports on New Material Production

David Brand, Cornell News Service

Geoffrey Coates, assistant professor of chemistry and chemical biology, and his colleagues have harnessed CO_2 feedstock, used by plants, to make synthetic polymers.

By mimicking nature, a chemist has found a seemingly efficient way to create a new plastic material. It would be either biodegradable or able to react with water to convert into nontoxic materials, and it would have properties such as impact resistance.

The natural system being copied is photosynthesis, nature's efficient way of extracting carbon dioxide (CO_2) from the atmosphere and turning it into both monomers and polymers in the form of sugars and polysaccharides. The breakthrough is tapping the same CO_2 feedstock used by plants to make synthetic polymers.

The advance, reported at the American Chemical Society meeting this week by Geoffrey Coates and his colleagues, is a zinc-based catalyst used to react CO_2 and epoxide molecules to produce a class of materials called polycarbonates.

An epoxide is a three-membered ring molecule, such as ethylene oxide. The resulting complex has an activity that is significantly higher than any previous catalyst in copolymerizations of CO_2, Coates says. This means that for the first time the process appears to be economical and have commercial possibilities.

One catalyst looks particularly promising, consuming more than 600 CO_2 molecules an hour, Coates says. "We are at the point at which reactions now only take hours, compared to days for previous catalysts."

Coates notes that the new polymer has potential application as a biodegradable material in packaging or in agricultural or biomedical materials. Difficulty of manufacture has, to date, yielded such small amounts of the polymer that a comprehensive study of its properties has not been made. However, Coates says, because of the low cost and accessibility of CO_2 and the attractive properties of polycarbonates, "the development of new, efficient catalysts for the polymerization process is a significant scientific goal."

Coates was assisted in this research by Cornell graduate student Ming Cheng and staff crystallographer Emil Lobkovsky.

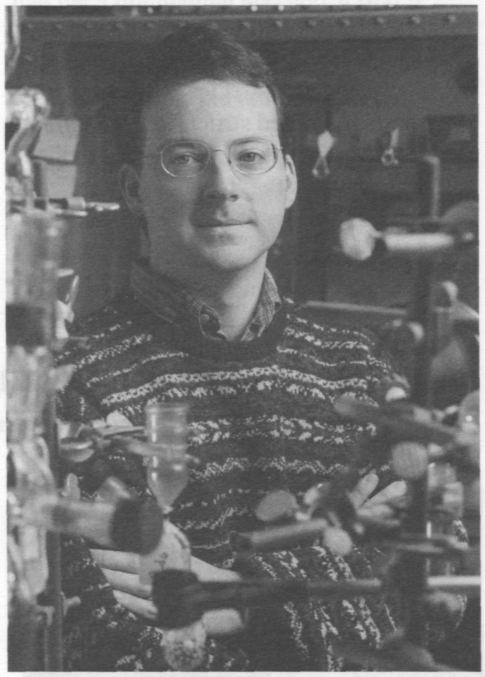
Coates Receives NSF 'Career' Grant and is Chosen as a '99 Sloan Fellow

excerpted from articles by David Brand, Cornell News Service

Geoffrey W. Coates, assistant professor of chemistry and chemical biology, has received a Faculty Early Career Development Program grant from the National Science Foundation (NSF). The value of the grant is $328,000 over four years.

Coates's research program will focus on the development of new catalysts for synthesizing biodegradable polymers from carbon dioxide. (See story above.) Coates expects his research to lead to a fundamental understanding of the mechanism of polymerization, as well as a feasible route to new polymer architectures that have potential commercial applications.

As part of his proposal, Coates has developed an integrated teaching and research plan in polymer chemistry. He also has developed educational outreach projects through the NSF-supported Cornell Center for Materials Research involving K–12 students as well as industrial scientists.



Coates earned a doctoral degree in organic chemistry from Stanford University in 1994. He joined the Cornell faculty in 1997 after completing postdoctoral studies at the California Institute of Technology.

Sloan Foundation Fellow

Professor Coates is one of four Cornell faculty members selected to receive Sloan Foundation Research Fellowships, the Sloan Foundation has announced.

Coates was among 100 outstanding young scientists and economists selected as Sloan Fellows this year, representing faculty from 52 colleges and universities in the United States and Canada. The fellows are engaged in research at the frontiers of physics, chemistry, computer science, mathematics, neuroscience, and economics. The fellowships, totaling $3.5 million this year, allow scientists to continue their research with $35,000 each over two years. Fellows are free to pursue whatever lines of inquiry are of most interest to them.

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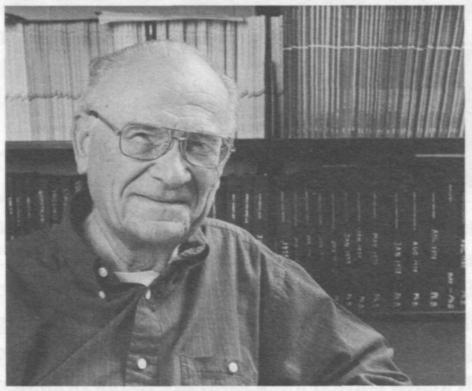
Coates, who joined the faculty in 1997, focuses his research on the development of new synthetic strategies for producing polymers of defined structure. One topic that is being intensely investigated in his research group is the development of catalysts for the synthesis of polymers from biorenewable resources, such as carbon dioxide and lactic acid.

Selection of young scientists as Sloan Fellows is based on exceptional promise to contribute to the advancement of knowledge. More than 400 scientists were nominated this year by department chairs and other senior scholars familiar with the researchers' talents. A committee consisting of 18 distinguished scientists, which this year included Jon C. Clardy, Horace White professor of chemistry and chemical biology, reviewed the nominations.

Wrestling with Protein Folding

Jan Greene, reprinted with permission from the NCRR Reporter



Building a protein molecule might seem like a task best left to nature. But now anyone with access to the Internet and some virtual reality software can manipulate a simulated protein chain, examine its potential energy in various shapes, or conformations, and gain a better understanding of how proteins fold and function. "The Problem With Protein Folding," a Web site developed at the Cornell Theory Center (CTC), offers a glimpse of the types of studies conducted at the NCRR-supported Parallel Processing Resource for Biomedical Scientists. The resource, directed by Dr. Thomas F. Coleman, professor of computer science and applied mathematics, provides the biomedical community with access to high-end computing and visualization technologies.

The resource staff has special expertise in biomolecular structures and protein folding, but they also are collaborating on efforts to quantitate ultrasonic imaging, optimize magnetic resonance imaging, and enhance three-dimensional (3-D) visualization for multiphoton microscopy. All of these projects require the extensive computational power of massively parallel computers, such as the resource's 160-processor IBM RS/6000 POWER parallel system. Other technologies available at the resource include a molecular docking program, a comprehensive suite of computational chemistry software, and state-of-the-art visualization resources, including a virtual reality system known as the CAVE (Cave Automatic Virtual Environment).

These powerful tools have enabled considerable advances in the understanding of protein folding, a field that is critical to both basic biology and the practice of medicine. The process by which a chain of amino acids—the building blocks of proteins—twists and curls upon itself determines the molecule's overall shape, which in turn affects the protein's ability to function. Substituting a single amino acid in a protein chain can distort the molecule's 3-D structure, impair its activities, and possibly even damage the overall health of an organism. For instance, replacing a single amino acid in a hemoglobin molecule can lead to sickle cell anemia, a painful debilitating disease marked by inefficient oxygen transport and deformed red blood cells.

Dr. Harold A. Scheraga, resource codirector and professor emeritus of chemistry at Cornell, has dedicated his career to investigating the mechanisms and consequences of protein folding. Using CTC's powerful computers, Scheraga and his team have designed new algorithms for simulating protein folding and producing 3-D images of proteins. One of their most basic model systems involves the amino acid alanine, which is depicted on the interactive 3-D Web site: http://www.tc.cornell.edu/Exhibits/Alanine/. Visitors to this site can manipulate and link simulated alanine molecules, one at a time, and seek the best possible conformation for the new polypeptide chain. The process becomes increasingly complex as the number of possible interactions between alanine molecules multiplies. "We'd like to extend this work to study the much longer chains of amino acids found in proteins, but we first need to improve our algorithms and use more high-powered computers," says Scheraga. "Our work could not be accomplished without access to the Parallel Processing Resource."

Scheraga is also collaborating with Nobel laureate Dr. Herbert A. Hauptman, who developed the "Shake-and-Bake" algorithm for determining crystal structure. The algorithm has been incorporated into a computer program dubbed SnB and has helped several research teams solve unknown crystal structures. In collaboration with Dr. Steven Ealick, director of the NCRR-supported MacCHESS synchrotron resource at Cornell, the scientists are now searching for ways to optimize and extend SnB's applications to solve the even more complex structures of macromolecules. The ultimate goal is to make a powerful, user- friendly version of SnB available to investigators working at the MacCHESS resource.

Synthesized spider venom may one day save stroke victims from brain damage

Blaine P. Friedlander, Cornell News Service

A new chemical isolated from spider venom might one day prevent human brain cells from dying after being deprived of oxygen for short periods, Jerrold Meinwald, professor of chemistry and chemical biology, believes.

Meinwald told the American Chemical Society meeting that smoke inhalation or stroke can cause overproduction of amino acid neurotransmitters, possibly resulting in brain damage. "What this venom could do is block the effect of the overproduction of some of the neurotransmitters," he says. "In effect, we're turning off the receiver."

The new neuroactive chemical, known as HF-7, originally was isolated from the venom of the funnel-web spider, *Hololena curta.* The work was a collaboration of chemists at Cornell, Leiden University in the Netherlands, and Cambridge Neuroscience Inc., a pharmaceutical firm in Cambridge, Mass.

Until the discovery of HF-7, it was thought that all spider venom components were amino acid–based. However, this venom is based on a nucleic acid building block, Meinwald says: "It was a genuine surprise. We had no idea at all that this toxin was made from a nucleic acid component."

Describing his search for this neuroactive chemical, Meinwald says, "Looking for a needle in a haystack is easier. There you just get a big magnet and you'll find it. Looking for this chemical, we didn't know what we'd find. We didn't know what kind of structure we were looking for."

HF-7 works in the brain by blocking one in a family of receptor molecules called kainate receptors, which act as gates in nerve cell membranes. Theoretically, during short bouts of oxygen loss, HF-7 should stave off severe brain damage. However, it is not clear if the synthesized venom can break through the blood-brain barrier.

The original characterization and synthesis of HF-7 were done at Cornell by graduate students Kevin and Jinping McCormick and elaborated by Yingbo Li, a graduate student, and Bruce Ganem, Franz and Elisabeth Roessler professor of chemistry.

CU Team's Decoding of a Protein's Structure May Help Create Cancer Drugs

Blaine P. Friedlander, Cornell News Service

For some years now, cancer researchers have known that cancerous tumors are fed by nutrients and oxygen through blood vessels generated by endothelial cells. Now the hope is to develop drugs to prevent the cells from forming the blood vessels, thus starving the tumors.

Researchers working at Cornell have brought this goal closer by deciphering the three-dimensional structure of a protein that helps cells build new blood vessels. The researchers also have discovered how a drug now in clinical trials binds to the protein methionine aminopetidase-2, or MetAP-2, for short.

Writing in the journal *Science,* a research team led by Jon Clardy, Cornell's Horace White Professor of Chemistry and Chemical Biology, and Shenping Liu, Cornell visiting scientist, note that this new

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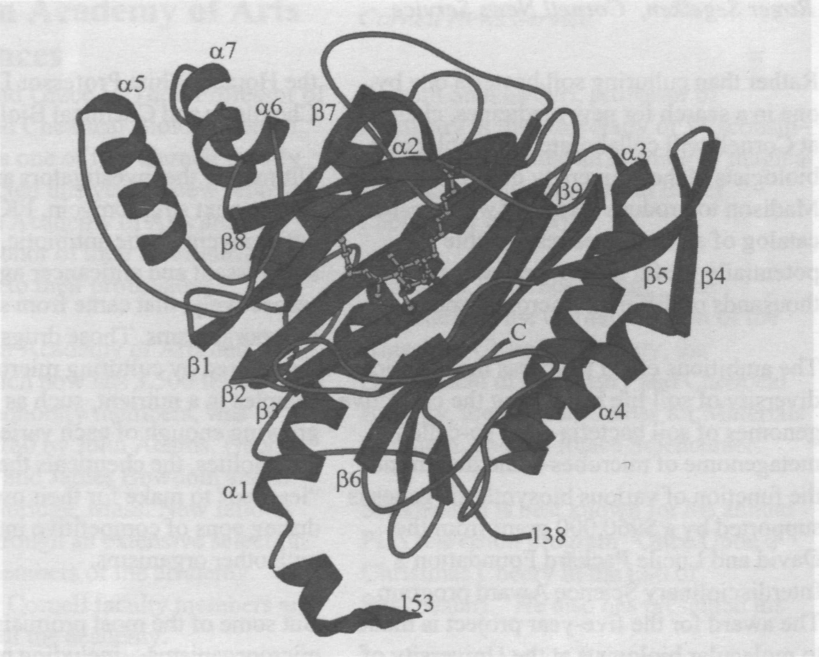

A skeletal view of the human protein MetAP-2 showing the fumagillin molecule bound to it and the relative sizes of the protein and the molecule. Clardy, Liu, et al

understanding of MetAP-2 might help chemists design more effective drugs.

"Our structure provides a better basis for designing drugs against cancer," says Liu. Because the protein, MetAP-2, was specifically shown to bind to the drug, he says, the research could pave the way for anticancer drugs with fewer side effects. The more specific the drug, the fewer the side effects, he says.

The researchers focused on the effects of fumagillin (pronounced foo-MAA-jill-in), a small organic molecule discovered from the fungus *Aspergillus fumigatus*. Earlier research had first discovered that fumagillin inhibits the formation of new blood vessels, a process called angiogenesis, and that it inhibits MetAP-2.

A semi-synthetic drug, TNP-470, a fumagillin derivative, currently is undergoing human clinical testing as an anticancer agent. By uncovering the three-dimensional structure of the targeted protein, MetAP-2, the new results indicate precisely how the drug binds to the protein.

Because TNP-470 is broken down quickly in the body, researchers are trying to develop improved versions. The Cornell research, by showing precisely how the drug fits into the protein, is an important step for pharmaceutical designers to synthesize better drugs, Clardy says.

Interfering with the blood flow into the tumor prevents growth. However, Clardy warns, "We need to be cautious and not get our hopes too high."

Several research groups are trying to figure out how MetAP-2 inhibits the formation of new blood vessels, he says, and the new drugs will take years of development and testing.

Clardy and his colleagues determined the three-dimensional structure of human MetAP-2 using X-ray crystallography at MacCHESS, the world-renowned Macromolecular Diffraction Facility at Cornell High Energy Synchrotron Source (CHESS). The synchrotron produces high-intensity, high-energy X-ray beams for scientific research.

MacCHESS is supported by the National Institutes of Health for research in drug design, protein and virus crystallography, and data collection from synchrotron sources. CHESS is supported by the National Science Foundation.

The research, "Structure of Human Methionine Aminopeptidase-2 Complexed with Fumagillin," appears in the November 13 issue of *Science*. It was authored by Clardy; Liu; Joanne Widom, Cornell chemistry researcher; Craig Crews, Yale University professor; and C.W. Kemp of Kemp Biotechnologies, Frederick, Md. Funding for the research was provided by U.S. Public Health Service grants.

"Metagenome" Project Aims for a Whole Earth Catalog of Soil Bacteria Genes

Roger Segelken, Cornell News Service

Rather than culturing soil bacteria one by one in a search for new medicines, chemists at Cornell will collaborate with molecular biologists at the University of Wisconsin–Madison to produce a kind of whole earth catalog of all the genes responsible for potentially useful natural products in thousands of different microbial species.

The ambitious effort to access the chemical diversity of soil life by cloning the collective genomes of soil bacteria—the so-called metagenome of microbes—and determine the function of various biosynthesis genes is supported by a $960,000 grant from the David and Lucile Packard Foundation's Interdisciplinary Science Award program. The award for the five-year project is made to molecular biologists at the University of Wisconsin, who will collaborate with a Cornell chemistry group led by Jon Clardy, the Horace White Professor Department of Chemistry and Chemical Biology.

Ultimately the investigators are searching for the next streptomycin, FK506, or actinomycin D, the antibiotic, immuno-suppressant and anticancer agent, respectively, that came from soil-dwelling microorganisms. Those drugs were discovered by culturing microbes in soil samples in a nutrient, such as agar, and growing enough of each variety to collect metabolites, the chemicals that microbes "learned" to make for their own purposes during eons of competitive interactions with other organisms.

But some of the most promising microorganisms—including many of the estimated 1,000 to 10,000 unidentified species awaiting discovery in any given gram of soil—cannot be cultured by traditional techniques available to microbiologists. So the Wisconsin-Cornell team hopes to "culture the unculturable" by taking advantage of a trait that soil microbes seem to have in common: All the genes responsible for biosynthesis of natural-product metabolites are clustered together on one contiguous and easily captured piece of DNA in the producing microbe.

Using molecular biology techniques, the investigators plan to move DNA fragments with natural-product genes from each unculturable microbe into bacterial hosts that can be cultured, such as *E. coli* and *Bacillus*. They will clone the gene-based pathways for metabolite production with bacterial artificial chromosome (or BAC)

vectors and encourage the hosts to make another organism's natural product (through heterologous expression).

The Wisconsin-Cornell collaboration estimates that roughly 1 million clones should be enough to outline the metagenome of the soil. Without recent advances in DNA cloning, nanoscale screening of chemicals for biological activity and genomics information management techniques, such a project would not be feasible, the investigators say.

In proposing the microbial metagenome project to the Packard Foundation, Wisconsin biologists Jo Handelsman and Robert M. Goodman and Clardy said the power of their approach "lies in the fusion of chemistry and biology to dissect one of the most complex problems in modern science — the biological and chemical diversity of soil, the richest environment on Earth." Foundation advisers apparently agreed, selecting the Wisconsin-Cornell project as one of 11, from a field of more than 100, to be funded in the first year of the Packard Interdisciplinary Science program.

Department News

Bruce Ganem Is Selected for Award from Chemical Manufacturers Association

Cornell News Service

Bruce Ganem, the Franz and Elisabeth Roessler Professor of Chemistry, has been selected to receive the 1999 National Catalyst Award.

The award is given by the Chemical Manufacturers Association (CMA) for excellence in teaching in the classroom and the academic laboratory. It includes $5,000 along with a medal and a citation.

The CMA began the awards program in 1957 to honor college professors of chemistry and of chemical engineering. Since then, it has been expanded to include teachers at two-year colleges and at high schools, as well as at middle and elementary schools.

Ganem, who joined the Cornell faculty in 1974, has taught both undergraduate introductory chemistry and organic chemistry, as well as numerous graduate courses in his field of organic synthesis. In 1991 he developed "The World of Chemistry," a popular course for nonscientists. Ganem also serves as the J. Thomas Clark Professor of Entrepreneurship at Cornell, and he created Chemistry 404, "Entrepreneurship in Chemical Enterprise," which was taught for the first time last semester. His recent Cornell research involves the emerging interfaces of organic and biological chemistry with biochemistry, biotechnology, and molecular medicine.

Ben Widom Receives Honorary Degree

The University of Utrecht has granted Professor Benjamin Widom the degree of doctor honoris caussa in Chemistry because of his excellent achievements. The honorary degree was awarded in March 1999.

Pete Wolczanski Elected to American Academy of Arts and Sciences

George W. and Grace L. Todd Professor of Chemistry and Chemical Biology Peter T. Wolczanski is one of five Cornell faculty members elected this year as new fellows to the American Academy of Arts and Sciences in honor of their distinguished contributions to their professions.

The American Academy of Arts and Sciences, which now has 3,500 fellows and 600 foreign honorary members, was founded in 1780 by John Adams, George Washington, and James Bowdoin and is based in Cambridge, Mass. New fellows are chosen through an extensive selection process by members of the academy. Seventy-four Cornell faculty members are now fellows of the academy.

Professor Wolczanski came to Cornell in 1981 after receiving his Ph.D. from the California Institute of Technology. In 1992, he succeeded fellow academy member Cornell Professor Emeritus Harold Scheraga to the Todd chair. His research is centered in the fields of organometallic, inorganic, and materials chemistry, where he specializes in studying the synthesis, structure, and reactivity of early transition metal compounds.

Bassam Shakhashiri Visits and Shows That "Science Is Fun"

Cornell News Service

Bassam Shakhashiri, professor of chemistry at the University of Wisconsin–Madison, presented an evening of magical chemical demonstrations in Baker Laboratory on April 7.

The event, "Science Is Fun," was presented by the Cornell Section of the American Chemical Society, the Department of Chemistry and Chemical Biology, the Cornell Center for Materials Research, and the Ithaca Sciencenter.

Shakhashiri is best known for his annual PBS television program "Once Upon a Christmas Cheery in the Lab of Shakhashiri." He also has presented his

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show at the Smithsonian National Air and Space Museum in Washington, D.C., and the Museum of Science in Boston.

He is well known academically for his development and use of demonstrations in the teaching of chemistry in lecture rooms and laboratories, as well as in convention centers and shopping malls. He has given about 1,000 lectures and presentations in the United States and abroad and has co-authored several publications. One of his pioneering efforts is an interactive chemistry exhibit on permanent display since 1983 at the Chicago Museum of Science and Industry.

1999 Project SEED College Scholar Named

Nikki Swan, participant in project SEED for the summer of 1998, has been awarded the Glenn and Barbara Ulloyt Project SEED College Scholarship by the American Chemical Society and the Committee on Project SEED. Nikki was one of 27 winners and was chosen based on her outstanding achievement.

Project SEED, instituted in the summer of 1990 with the dual efforts of David Pysnik, high school chemistry teacher at Sidney High School, Sidney, N.Y., and Bruce Ganem, Franz and Elisabeth Roessler Professor of Chemistry, brings five top chemistry students from Sidney High School to participate in research at Cornell University.

Several Spring Lecture Series Bring Prominent Chemists

April and May 1999 brought several exciting chemists to the Department of Chemistry and Chemical Biology.

Bassam Shakhashiri, from the University of Wisconsin at Madison gave a public lecture entitled "Science is Fun" (see article on page 11).

Blomquist Lectures

Jack Dunitz, Emeritus Professor Chemical Crystallography from ETH (Swiss Federal Institute of Technology), Zurich, presented the 1999 Blomquist Lectures, "Attractions and Repulsions in Molecular Crystals," and "Polymorphism: The Same and Yet Different" on April 15 and 16.

After studying chemistry at Glasgow University (B.Sc. 1943; Ph.D. 1947), Professor Dunitz held research fellowships at Oxford University, California Institute of Technology, U.S. National Institutes of Health, and the Royal Institution, London before taking up a Professorship at the ETH, Zurich, a post that he held until his retirement in 1990. He has held visiting professorships in the United States, Israel, Japan, Spain and the United Kingdom, has been elected to membership of several learned societies, and holds honorary doctorates from the Israel Institute of Technology (Technion) and the Weizmann Institute of Science. Among his awards are the Paracelsus Medal (Swiss Chemical Society) and the Gregori Aminoff Prize (Royal Swedish Academy of Sciences). Dunitz has written more than 300 scientific papers and is the author of *X-Ray Analysis and the Structure of Organic Molecules* (Cornell University Press, 1979), based on his 1976 Baker Lecture series at Cornell, and *Reflections on Symmetry in Chemistry... and Elsewhere* (with E. Heilbronner, Verlag HCA, Basel 1993).

Dunitz's research interests concentrated on the use of crystal structure analysis not merely as a method of establishing atomic arrangement but also as a tool for studying a diversity of chemical problems, such as the structure and reactivity of medium-ring compounds, ion-specificity of natural and synthetic ionophores, and molecular structure-energy relationships. From his laboratory came the method of deriving model pathways for prototypic chemical reactions from the structural information in crystal structures, thus making a connection between the "statics" of crystals and the "dynamics" of reacting chemical systems. Other work in related directions included new interpretations of atomic displacement tensors in crystals in terms of internal molecular motions, and studies of experimental electron density distributions from accurate low-temperature X-ray data. More recently, he has turned to problems of polymorphism, phase transformations in solids, and solid-state chemical reactions.

The lecture series, in honor of former Professor Alfred T. Blomquist was established by his family, former students, and co-workers.

Roessler Lectures

Gerhard Ertl, Director of the Fritz-Haber-Institute of Max-Planck-Gesellschaft, gave the Spring 1999 Franz and Elisabeth Roessler Lectures, "Heterogeneous Catalysis: From 'Black Art' to Atomic Understanding" and "Dynamics of Reactions on Surfaces" on April 19 and 20.

Dr. Ertl, born in Stuttgart, Germany in 1936, received his Ph.D. in chemistry in 1965 from the Technical University of Munich, where he pursued his thesis research under the guidance of Professor H. Gerischer. From 1965-68 he was an assistant and lecturer at the University. In 1968, Professor Ertl accepted a position as Professor and Director at the Institute for Physical Chemistry, Technical University of Hannover, and in 1973 he went on to a similar position at the University of Munich. Ertl became the Director at the Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin, in 1986.

Ertl has co-edited and served on the editorial boards of several journals, is a member of several academies and societies including the German Academy of Sciences "Leopoldina," and is a foreign honorary member of the American Academy of Arts and Sciences. In 1995, Dr. Ertl was appointed Vice President of the German Science Foundation. Other awards and honors have included the Liebig Medal of the German Chemical Society in 1987; the Japan Prize of the Science and Technology Foundation of Japan, in 1992; and the Wolf Prize in Chemistry from the Wolf Foundation, Israel in 1998.

The lectures are named in honor of an endowment to the chemistry department by Franz Roessler, a German chemist who emigrated to the United States in 1882 to found the Roessler and Hasslacher Chemical Company, once a large manufacturer of insecticides, fungicides, and refrigerants. The company became part of Dupont in 1930. Roessler's son Hans was a student in Cornell's Department of Chemistry in the early years of the century. Roessler family endowments support a named professorship in the Department of Chemistry, currently held by Bruce Ganem, as well as these lectures by prominent German chemists.

ISCOL Lectures

F. Sherwood Rowland, Nobel laureate and Donald Bren Research Professor of Chemistry at the University of California at Irvine, inaugurated the Jill and Ken Iscol Distinguished Environmental Lectureship with his two lectures, "Our Changing Atmosphere: Stratospheric Ozone Depletion and Global Warming," and "True, False and Side Steps Toward Understanding – the Case of Ozone Depletion by Chlorofluorocarbons" on April 20 and 21.

Special Seminar

Duilio Arigoni, Professor at the Laboratory of Organic Chemistry at ETH Zurich, and former Baker Lecturer (1975) and AD White Professor-at-Large (1980-86) re-visited the department the last week of April and gave a lecture entitled "Studies on Some Mechanistically Unusual Biological Alkylation Reactions."

Aggarwal Lectures

Frank Bates, from the University of Minnesota, delivered the 1999 Aggarwal Lectures in Polymer Science, "Block Copolymers—Designer Soft Materials," and "Interfacial Entanglements—A New Approach to Toughening Polyolefins" on May 24 and 25.

Professor Bates received a B.S. in Mathematics from SUNY Albany (1976) followed by S.M. (1979) and Sc.D. (1982) degrees in Chemical Engineering from the Massachusetts Institute of Technology.

After spending seven years as a member of the technical staff at Bell Laboratories, Dr. Bates joined the Chemical Engineering and Materials Science Department at the University of Minnesota, where he is now Distinguished McKnight University Professor.

Dr. Bates has received several awards and honors including a Distinguished Member of Technical Staff appointment at Bell Labs, the 1989 Dillon Medal, the 1993 George Taylor Distinguished Research Award from the University of Minnesota, and the 1997 High Polymer Physics Prize from the American Physical Society,

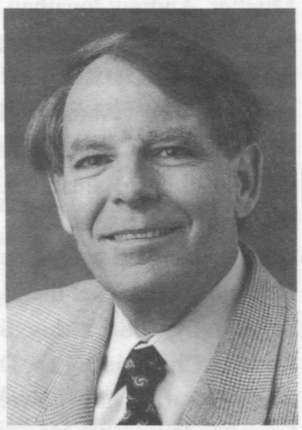
Dr. Bates is a fellow of the American Physical Society and is just completing a three-year term as President of the Neutron Scattering Society of America.

This lecture series was a gift of the late Sundar L. Aggarwal (1922–1996), who earned his Cornell doctorate in the then emerging field of polymer science and engineering with Professor Frank A. Long in 1949. After postdoctoral work with Paul Flory at Cornell in 1950, he joined General Tire and Rubber Company (now GenCorp) in 1957, serving in various research capacities and retiring as vice president and director of the GenCorp research division in 1988.

On his retirement Aggarwal founded Global Polymer Technology Associates, an industry consulting firm with international clients. He had received industry awards and had published articles on and received patents for synthetic rubbers, block polymers, and composites. He was a fellow of the Institute of Materials Science, a member of the American Chemical Society, the Directors of Industrial Research, and the Industrial Research Institute. He was also active as an editor and as a member of industry awards and evaluation panels.

Fall 1999 Baker Lectures

The fall lecturer, W. Carl Lineberger, E.U. Condon Distinguished Professor of Chemistry and Biochemistry at the University of Colorado, will present a series of lectures on the topic "Gas Phase Chemistry of Radicals, Anions and Molecular Clusters" in October and November. Professor Lineberger's work is primarily experimental, and he uses a wide variety of laser based techniques to study structure and reactivity of gas phase ions. Recent studies have been directed toward elucidating the structure of transient reaction intermediates, to developing understanding of the gradual evolution of physical properties from an isolated molecule to a solvated species and to real-time investigations of reaction dynamics.



W. Carl Lineberger

His recent honors include the William F. Meggers Prize of the Optical Society of America, the Earle K. Pyler Prize of the American Physical Society, and the Irving Langmuir Prize in Chemical Physics, presented by the American Chemical Society. He is a member of the National Academy of Sciences, the American Academy of Arts and Sciences, a Fellow of the American Physical Society and the American Association for the Advancement of Science, as well as a member of Sigma Xi and the American Chemical Society. He currently serves as Co-Chair of the Commission on Physical Sciences, Mathematics and Applications for the National Research Council.

Commencement 1999

Forty-eight new bachelor's degree recipients convened in Baker 200 with members of the faculty, friends, and family for the Department of Chemistry and Chemical Biology's diploma presentation on Sunday, May 30. The departmental ceremony and reception followed the 131st all-university commencement at Schoellkopf Stadium.

The new graduates were presented their diplomas by Professor and Chair Paul Houston who spoke on the changing phlogiston theory and challenged graduates to use the method of inquiry that they were taught here to test theories in the future and to advance themselves as far as they are willing to go.

The Class of 1999

January Graduates

Jinnho Lee, Ron Margolis, Jay Thomas Mueller, Andrew Jonathan Wong

May Graduates

Jeffrey William Abraham, Karen F. Ben-Dor, Kira V. Bulazel, Dante Anthony Cerza, Keith Crossman Ellis, Xiaofeng Fu, Michael Jay Hersh, Elke L. Hodson, Chris Huang, Joanna Huang, Amanda Beth Hummon, Cora Yael Iberkleid, Raza Sajjad Jafri, Sonal P. Jog, Suneet Yogesh Kothari, Christina J. Lee, David K. Lee, Remy Rosario Lobo, Lawrence Kong Low, Thi Khanh Ly, Yousaf Mahmood, Kurt Allan Melstrom, Jr., Mauro Merolle, David James Metzger, Scott Lewis Midwall, Hyung-Song Nam, Vi Huu Nguyen, Joanna Louise Ossinger, John Patrick Perotti, Kyle Jeanne Popovich, Thomas Puzio, Kimberly Ann Regan, Audrey Chan Rhee, Thomas Martinez Ruiz, Oren Alexander Scherman, Rebecca Lynn Schuster, Rajeev Mahesh Shah, Anu Singhal, Spencer Evan Temkin, Joshua Zebadiah Willey, Jessica Marie Wojtysiak, Christina Wai-Yun Wong, Chang-I Wu

August Graduates

Michael Song

Graduating with Honors in Chemistry

summa cum laude
Lawrence Kong Low
magna cum laude
Oren Alexander Scherman, Joshua Zebadiah Willey
cum laude
Keith Crossman Ellis, Elke L. Hodson, Amanda Beth Hummon, Kimberly Ann Regan

Graduating with Honors in Biological Sciences

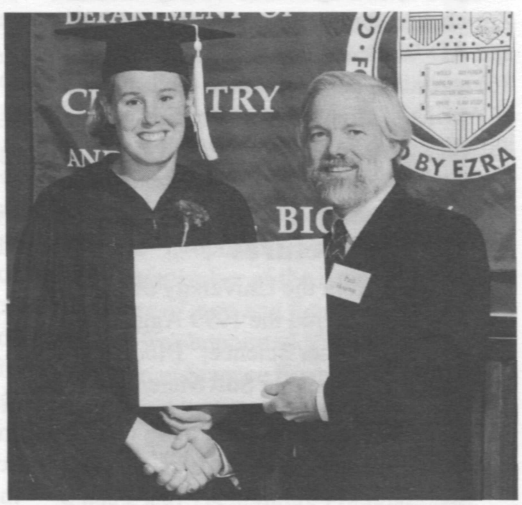
magna cum laude
Hyung-Song Nam
cum laude
Audrey Chan Rhee

Graduating with Honors in Classics

summa cum laude
Christina Wai-Yun Wong
cum laude
Joanna Louise Ossinger

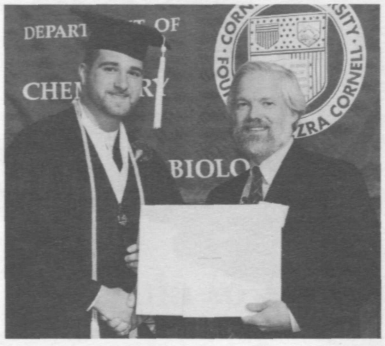
Graduating with Distinction in All Subjects

Michael Jay Hersh, Cora Yael Iberkleid, Christina J. Lee, David K. Lee, Lawrence Kong Low, Ron Margolis, Kurt Allan Melstrom, Jr., Mauro Merolle, David James Metzger, Kyle Jeanne Popovich, Thomas Puzio, Audrey Chan Rhee, Oren Alexander Scherman, Anu Singhal, Joshua Zebadiah Willey, Christina Wai-Yun Wong



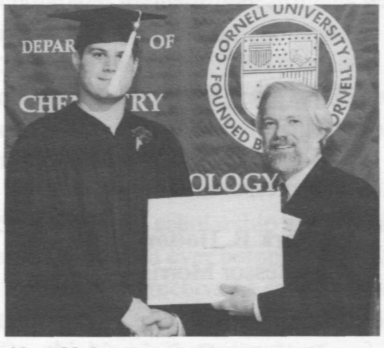
Kimberly Regan with Chair Paul Houston

The **Leo and Berdie Mandelkern Prize** was established in 1991 with a gift from Leo Mandelkern, AB '42, PhD '49, and his wife, Berdie, and is awarded annually to an outstanding student of the senior class majoring in chemistry who will go on to graduate study in chemistry or biochemistry. This year's recipient is **Oren Scherman,** who is planning to attend the California Institute of Technology.

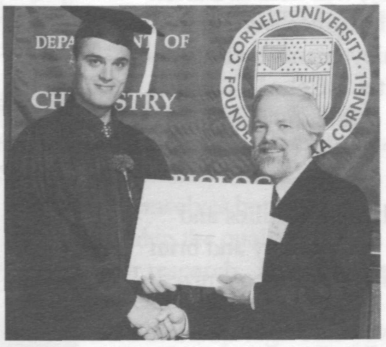


Oren Scherman with Chair Paul Houston

The **George C. Caldwell Prize** was established in 1913 with a gift from Mrs. Grace Caldwell Chamberlain and Professor Frank Caldwell and is awarded annually to two senior chemistry majors who have shown general excellence. This year's recipients are **Kurt Allan Melstrom** and **David James Metzger.**

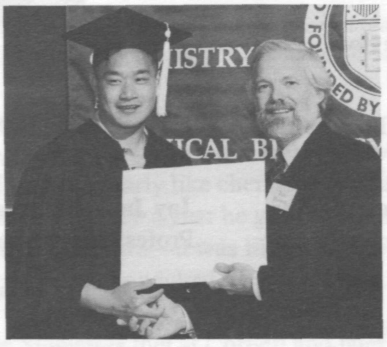


Kurt Melstrom



Joshua Willey

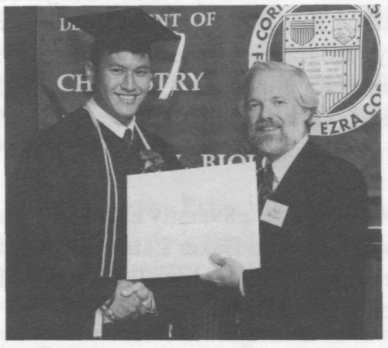
The **American Institute of Chemists Medal** is presented to an outstanding graduating senior who has a demonstrated record of leadership, ability, character, and scholastic achievement. This year's recipient is **Joshua Willey.**



Lawrence Low

The **Hypercube Scholar Award for Scholastic Excellence in Chemistry,** consisting of a certificate and copy of HyperChem software, was established in 1998 by Hypercube Inc. It is given to a graduating senior who has shown excellence in courses and research and who has shown an interest in chemical molecular modeling. This year's recipient is **Lawrence Kong Low.**

The **Merck Index Award,** which consists of a Merck Index with the name of the recipient imprinted in gold, is given by Merck & Co., Inc., and presented to two outstanding chemistry majors in the senior class. This year's recipients are **David K. Lee** and **Hyung-Song Nam**.



David Lee

The **Harold Adlard Lovenberg Prize** was established in 1939 with a gift from Mr. Oscar R. Lovenberg and is awarded annually to a member of the junior class with a major in chemistry who has shown general excellence. This year's recipient is **Susan Crown.**

The **ACS Analytical Prize** is awarded to a student in the College of Arts and Sciences who has completed the third year of undergraduate study and who displays interest in and aptitude for a career in analytical chemistry. The recipient, **Sarunya Bangsaruntip,** receives an 8-month (16 issues) subscription to *Analytical Chemistry.*

The **CRC Press Chemistry Achievement Award** is presented to two sophomore chemistry majors who do outstanding work in organic chemistry courses 375–358 or 359–360. This year's recipients are **Pakorn Kanchanawong** and **Mike Walton.**

The **A. W. Laubengayer Prize** was established in 1966 with a gift from former students and colleagues of Professor Laubengayer and is awarded annually to an outstanding student in each of the introductory chemistry courses 103, 207, and 215. This year's recipients, who are all in their freshman year, are **Sabiha Barot, Daniel Frenkel,** and **Kristin Vyhnal.**

Commencement 1999

The 1999 University Ph.D. Recognition Ceremony, was held in Barton Hall on Saturday, May 29. Recipients of doctoral degrees were individually recognized for their significant academic achievements by President Hunter Rawlings and Graduate School Dean Walter I. Cohen. Degrees were conferred during the 131st Commencement ceremony held on May 30 at Schoellkopf Field.

Following the university exercises, graduates with their families and friends came to Baker Laboratory for a reception in the lobby and brief ceremony in 200, where Professor and Chair Paul Houston recognized each graduate.

Graduates attending the ceremony in Baker 200 are pictured at right,
Top: Alan van Giessen
Second row (l-r) Mark Holton, Lee Geiger, Christophe Galopin, John Townsend
First row (l-r): Erika Merschrod, Courtney Spencer Warren, Kevin Weber

Graduate Degrees Awarded

August 1998

Christopher Mark Bender
Professor Burlitch

Elizabeth Susan Cohen
Professor Carpenter

Robert Bernard Grubbs
Professor Fréchet

Jason C. Kirkwood
Professor Albrecht

Kevin Michael Lewandowski
Professor Fréchet

Julie Alexandra Mueller
Professor Houston

Larry Lee Springsteen
Professor Houston

Sean Vincent Taylor
Professor Begley

John Raymond Townsend
Professor Usher

Courtney Spencer Warren
Professor DiSalvo

Shaofeng Xie
Professor Fréchet

January 1999

Katherine Brooke Aubrecht
Professor Collum

Hsiu-Ju Chiu
Professor Begley

Laura Marie Dobeck
Professor Houston

Jay Judson Farmer
Professor Meinwald

Jennifer May Havard
Professor Fréchet

Christopher David Wilson Jones
Professor DiSalvo

Darren John Kassab
Professor Ganem

Ana-Rita Mayol
Professor Wolczanski

Matthew Jesse Pugmire
Professor Ealick

Daniel Francis Schafer II
Professor Wolczanski

Louis John Sparvero
Professor Usher

Alan E. van Giessen
Professor Widom

Doo-Kyung Yang
Professor Zax

Portia Dalecene Yarborough
Professor Sogah

May 1999

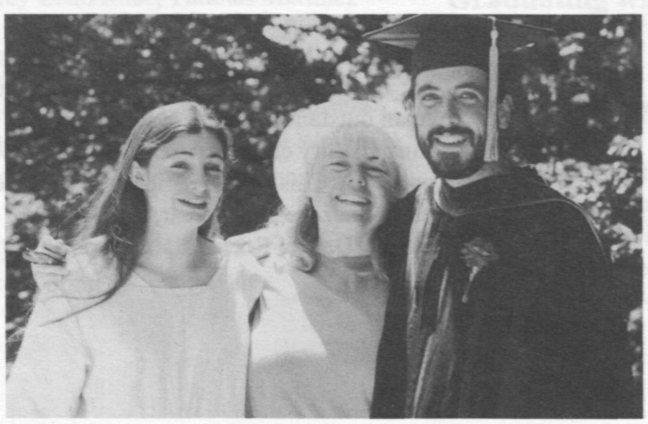
Christophe Claude Galopin
Professor DiSalvo

Mark B. Holton
Professor Morrison

Mayra B. Reyes
Professor Carpenter

Kevin T. Weber
Professor Ganem

Peter Athol Willis
Professor Davis



Mark Holton with guests Sarah Llop, (left) and Nancy Munkenbeck, (center)

Graduate Awards

Douglas Weibel was recognized at the College of Arts and Sciences Awards Convocation on April 12 as an outstanding teaching assistant. Douglas was awarded the Stephen and Margery Russell Distinguished Teaching Award.

The **DuPont Teaching Prizes** are awarded annually to teaching assistants who have demonstrated excellence in teaching and a desire to upgrade the quality of undergraduate education. Graduate students who received the prize for 1999 were **Emily Baird, Matt Gronquist, Anthony Michaud, Christopher Hoffman, Darrell Hurt** and **Cheng Lin.**

The **Tunis Wentink Prize** is awarded annually to outstanding graduate students in any area of chemistry who have distinguished themselves both academically and in the quality and quanitity of their research. Prizewinners present their research findings at a symposium held in the spring. This year's winners were **Garegin Papoyan, Peter Willis,** and **Min Wu.**

The **Howard Neal Wachter Prize** is awarded annually to a promising graduate student in physical chemistry who has demonstrated a potential to contribute to the profession. This year's recipient was **Hans Stauffer.**

The **Richard Evans Prize** is awarded when faculty and students from introductory chemistry courses reach a broad consensus that there is a teaching associate who meets the high standards of service to the students set by the late Richard Evans. This year's honoree was **Vance Breakwell.**

Alumni and Friends News

A Formula to Enjoy Life

Adapted from a story by George Lowery, published in the Summer 1999 issue of Communiqué, with the permission of the Cornell Office of Alumni Affairs and Development Communications.

"A good education helps you appreciate the world. We received a good education at Cornell, and we're glad to make money available for young people."—Morgan Sinclaire

"Brains weren't given exclusively to wealthy people," says Morgan Sinclaire '40. This conviction led Sinclaire and his wife, Esther Jones Sinclaire '40, to create the Morgan and Esther Sinclaire Scholarship for chemistry students with a gift of $500,000 to the Scholarship Challenge Campaign. "We support education because we both feel that we need more scientifically literate people in this country."

"Students need scholarship aid probably more today than ever before," says Esther Sinclaire, who received a scholarship to study in the College of Human Ecology. "Our thinking is that supporting scholarships is the way to go if you have any money to give away."

Morgan Sinclaire's interest in chemistry began while he was a Cornell student. He studied with Professor A. W. Brown, whom he describes as "a great showman. He put on a good show for freshman who didn't particularly like chemistry but had to take it. Twice a year he gave his famous liquid air lecture—it was like a vaudeville show. Students packed the auditorium."

The Sinclaires met at Cornell and later moved to California. There Morgan worked as a chemist for Douglas Aircraft (later McDonnell Douglas, now Boeing) on a variety of projects. "We investigated 'hard landings' that resulted in fires and hypothesized what conditions would enable people to walk away without injuries if it weren't for the actual fire," he says. We were concerned with byproducts of burning materials, such as wool, which produces a certain amount of cyanide. It was really very interesting. I had a ball!"

Esther Sinclaire pioneered growing wildflower gardens in California. Their beauty has attracted the attention of magazines. "We had a spare half acre of our lot and didn't know what to do with it," she explains. "I had always liked the wildflowers in New York, so I thought I'd try it. I got the seeds and mixed in native California poppies. It took a lot of work, but it was very rewarding."

Since Morgan's retirement in 1973, the couple have devoted themselves to a number of educational and cultural pursuits and hobbies they share. They own collections of American and Japanese folk art and an extensive collection of bears. "I like handmade, creative, original things," Esther Sinclaire says of her bears. She has also donated a number of designer gowns and other clothing to the College of Human Ecology's costume collection.

An avid photographer, Morgan shoots pictures of his wife's flowers and their bear collection. "I find they're rather nice, personable pets," he jokes. "You don't have to take them to the vet; they don't eat or muss up the house. I use some of the bears in cynical photographic scenes relating to the stock market. For example, I'll have two bulls posed among a whole mess of bears because I'm fundametally bearish."

The Sinclaires continue to seek out new experiences. "We could use a little more time in the day—like another 12 hours or so," Morgan Sinclaire says. "Of course, we'd fill it up with something. But that's what makes life interesting. We seldom get bored. And Esther's probably the best cook in town. A good education helps you appreciate the world. We received a good education at Cornell, and we're glad to make money available for young people."

A.William Johnson PhD '54
Professor emeritus and dean (of the graduate school) emeritus of the University of North Dakota, now residing in Bella Vista, Ark., has published a new textbook for the one-semester organic chemistry course directed to students who are not majoring in chemistry. It is published by Jones and Bartlett of Sudbury, Mass.

Anne Kuhlman Taylor PhD '73
Gerard T. Taylor PhD '70
Anne writes that her husband, Jerry, was A T. Blomquist's next to last student. He then was a postdoc for Harold Scheraga while she finished her degree studying with M. J. Goldstein.

Jerry went to work for Norwich-Eaton Pharmaceuticals (now part of Procter & Gamble) in chemical development and after nine years moved to Hoffman-LaRoche where he worked in chemical manufacturing. Thus, he became a chemical engineer after graduation in organic chemistry. After 15 years there, his department was shut down, and he found a job in Louisiana at a small pharmaceutical company called INO Therapeutics, in Port Allen (Baton Rouge). They are making medical nitric oxide (NO) gas, which is given to babies with respiratory problems. They needed a person with pharmaceutical experience to be the plant manager. Recently Jerry has become the director of research and development, which allows him to spend more time on academic pursuits.

Anne did not initially pursue a career since their first child was born when she was completing her degree. Later, while they lived in upstate New York, she taught at three of the colleges on a temporary basis. When they moved to New Jersey, she found a job in analytical chemisty—first at Parke-Davis (Warner-Lambert) and then at Schering-Plough. When they moved to Louisiana, that type of work was not available, so she has been self-employed as a technical writer and consultant. Anne has done writing for her former employer and some consulting for a small company that manufactures an antiseptic hand lotion. However, she wants to find some more projects and is interested in making more contacts.

Since moving to Louisiana, Anne and Jerry have been 'empty nesters'. Their daughter, Amanda, who was born in Ithaca, is a Barnes and Noble bookstore manager in North Jersey. Their son, Ben, is living in Tempe, Ariz., where he is a student and rock musician. He plans a career in the music business.

Lowell Garner AB '76
Dr. Garner was recently mentioned in an article by the *Cornell Chronicle* regarding the benefits of Cornell degrees. "Dr. Lowell Garner found his Cornell degree gave him the analytical tools that have led to a very successful and rewarding career in medicine. Garner is the attending physician in the Department of Anesthesia and Pain Medicine at Cayuga Medical Center here in Ithaca.

"'My Cornell degree taught me how to approach problem solving — it wasn't so much about the information I gained as a chemistry major per se, as it was mastering a way of thinking,' said Garner, who later went on to pursue a medical degree. 'I never could have foreseen the doors that would open to me as a Cornell graduate.'"

Tom Harris PhD '78
Tom writes: "It was with a feeling of nostalgia that I read of the name change of the Cornell Department of Chemistry to 'Chemistry and Chemical Biology'. In part this was because my intention in high school was to become a biochemist and I realized that one could do this either as a chemistry major or a biology major. I decided to major in chemistry as an undergraduate and was diverted by many other fascinating areas of chemistry so I never got into the field of biochemistry. Now I see that Cornell has combined the two areas!

"I thought this would be a good opportunity to update the department on what I have been doing since graduating with a Ph.D. in inorganic chemistry in 1978 (E. L. Muetterties group). After a one-year postdoctoral, I went to work at Gulf Research and Development Co. in Pittsburgh, Pa., mainly in the areas of homogeneous catalysis and petrochemicals. Because of the uncertain fortunes of the petroleum industry, Gulf was taken over by Chevron (Standard Oil of California) in 1985. After moving out to Chevron's research center in Richmond, Calif., I subsequently found another Cornell chemist (whose name was familiar to me during my Cornell years), Dr. Rawls Frazier.

"I'm currently a staff scientist in the Catalytic Materials Team of the Catalyst Unit of Chevron Research and Technology Company, where I've worked mainly in heterogeneous catalysis. I'm privileged to work with some highly talented colleagues in a number of disciplines. Various projects have involved zeolite synthesis, catalyst preparation, and catalyst and process development. Currently among other responsibilities I carry out the first level of catalytic screening on new catalytic materials that might have application in petroleum refining and petrochemicals. I'm one of the people who helped to bring computer molecular modeling to Chevron Research and I've managed to use molecular modeling to make some significant contributions to zeolite science. This is perhaps a happy irony, since I did not make myself aware of the activities of Professors Hoffman and Scheraga while at Cornell, but now see their contributions to the field time and time again.

"Although it has been 20 years (!) since I left Cornell, I still remember the professors, my fellow students, and the chemistry community fondly."

Craig J. Forsyth, PhD '89
Craig joined the faculty at the University of Minnesota in 1992 as a 3M/Alumni Assistant Professor, and has served as a McKnight Land-Grant Professor and is currently an associate professor of chemistry. His research program has focused on the development and implementation of strategies for the total synthesis of complex natural and unnatural products and their use to probe important biological processes. According to the press release by Bristol-Myers Squibb Company, Craig has recently been awarded a 1999 Bristol-Myers Squibb unrestricted grant in synthetic organic chemistry.

Isabelle Kagan AB '91
Isabellesuccessfully defended her PhD thesis, "Camalexin Biosynthesis in Arabidopsis: A Study of Putative Intermediates and of the Effects of Different Pathogens on Its Production," in December 1998 and graduated in May 1999 with a PhD from Michigan State University. She is doing a one-year postdoc at the CNRS-IBMP in Strasbourg, France.

In Memoriam

Simone Jacobson, Ph.D. '73, 11/24/98
William D. Miller, A.B. '63, 12/6/98

Norman Nielsen, Ph.D. '75
In answer to my request for information on missing alumni, **George Kline, Ph.D. '73** sent me this kind letter. "Norman showed me the ropes as the senior TA in experimental chemistry (300?). He then survived a serious illness, Hodgkin's disease, and went on to Canada for postdoctoral work.

"Some years later, I was working in Michigan and a coworker mentioned there was a Cornell Ph.D. that survived the big layoffs at Chrysler. I called and reestablished a friendship with Norm. He was able to make it through Chrysler's darkest years by switching from a research role in small molecule air pollution–related chemistry to a regulatory responsibility. His time was now spent in Washington, D.C., looking after Chrysler and understanding if not influencing the evolution of federal automotive pollution requirements.

"Norman was always a cynic, lecturing over lunch on how many clean Chrysler product miles could be driven with less harmful atmospheric pollutants than one decorative holiday season fire in the hearth. And how my salad was more fattening than his meat and potatoes.

"I called Norman in about 1990 and he was not available for one of our occasional luncheons. Another call was answered by a receptionist who informed me that Norman had died some months before. I was not able to obtain details and was disappointed that I had not been notified of a funeral or memorial service."

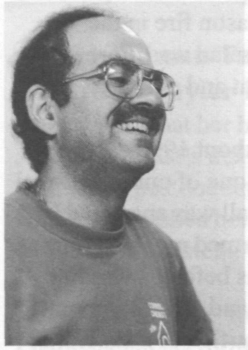
Cornell Breakfast at ACS Meeting in New Orleans

During the 218th national meeting of the American Chemical Society on August 22–26, 1999, the Department of Chemistry and Chemical Biology will host a continental breakfast for alumni and friends. Please join us on Tuesday, August 24, at 7:45 a.m., in the Marriott Hotel. For more information on the ACS meeting, visit the ACS Web site at **www.acs.org.**

Reunion 1999

Charles Wilcox, Simon Bauer, and Stan Marcus enjoying the reunion festivities.

Franklin de Beers, Earl Peters, and Franklin's son, Sandy



Charles Good

On Friday, June 11, the Department of Chemistry hosted an open house for returning alumni and friends in the faculty lounge of Baker Laboratory. The tables in the lounge were filled with memorabilia to reminisce over and refreshments to replenish energy for walking around campus.

Among this year's returnees were Rolf Barth AB '59, Carl Berke AB '74, Al Blomquist AB '55, Ken Comer AB '74, Franklin de Beers BChem '34, Charles Good AB '79, Robert, PhD '52, and Lou, Ph.D. '71, Hughes, Mary Schuster Jaffe AB '37, Peter Kim AB '79, John Macdonald BChem '39, and Joanna Ossinger AB '99. We hope to see you next year!

John Macdonald with son, Don

Mary Schuster Jaffe, Joanne Widom, Joanna Ossinger, and Barbara Baird

Robert Fay, Jerrold Meinwald, Robbie Comer, Ken Comer, and Geoffrey Coates

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