# Chemistry and Chemical Biology

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## The Chairman's Notebook

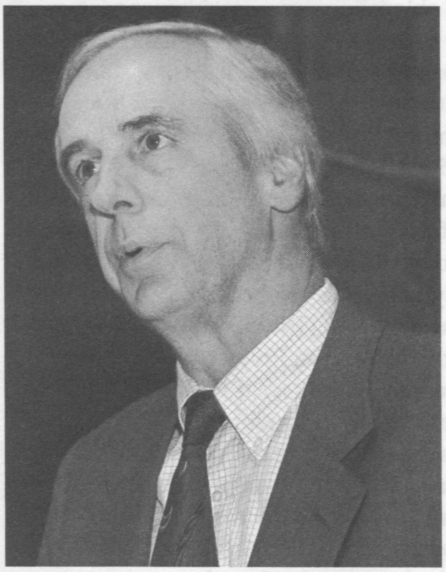
What's in a name? Any corporate executive will tell you that a name is worth millions. It identifies a company with its product, it backs that product with a guarantee, and it assures the public of future advances in the product line by associating the product with the company's past history of success. Corporations are thus reluctant to change their name unless that change is significant.

The situation is much the same in academia. Chemistry at Cornell is now officially known by a new name, the Department of Chemistry and Chemical Biology. The name change is significant in that it points to a major new direction of growth. But the name also links our new product with a familiar one, it pledges our guarantee that the new product will achieve the highest standard, and it associates that product with a long tradition of accomplishment.

With support from Provost Randel and Dean Lewis, the initiative in chemical biology embodied in our change of name will bring as many as five new researchers in this field to the department during the next five years. While maintaining and even expanding our strength in the traditional areas of chemistry, we hope to attract the best scientists interested in combining chemical synthesis and macromolecular crystallography to study biological problems at the molecular level. Many Cornell faculty in this exciting area of research are already prominent members of our department, and others have moved or will soon relocate to collaborate with them. For example, Steve Ealick has recently joined the department and resettled his research group onto the third floor of the Olin Chemistry Research Laboratory. A crystallographer by training, Steve is responsible for MacCHESS, a beam-line facility at the Cornell High-Energy Synchrotron Source that provides users with high-quality crystallographic data on biological systems. (A more detailed look at Steve's research appears on page 4.)

Jon Clardy and Bruce Ganem, former chairs of the department, are also key players in the chemical biology initiative. Together with Steve Ealick and Rick Cerione, of the Department of Molecular Medicine at the College of Veterinary Medicine, these faculty are most responsible for convincing the university and their chemistry colleagues of the importance of the emerging area of chemical biology. Their goal is to discover how to control enzyme function in biological systems by combining crystallographic data with synthesis to devise small molecules that moderate the enzyme's activity.

A glimpse of the promise of this area was provided during a September 12 afternoon symposium celebrating our name change. President Hunter Rawlings opened the festivities by expressing the strong backing of the university administration for our efforts. He was followed by three outside speakers who summarized some of the exciting progress in this area. Wayne Hendrickson of the Department of Biochemistry and Molecular Biophysics, Columbia University, spoke on "Molecular Mechanisms Used by HIV gp120 in Cell Entry and Immune Evasion." Next, Joanne Stubbe of the Department of Chemistry, Massachusetts Institute of Technology, gave a talk entitled, "The Importance of Transient Protein-Protein Interactions in Metabolism? The Purine Biosynthetic Pathway as a Paradigm." The symposium concluded with Stuart Schreiber of the Department of Chemistry and Chemical Biology, Harvard University, who spoke on "Discovering and Using Small Molecules for Chemical Genetic Research." A reception and dinner followed the symposium, and President Emeritus Frank Rhodes provided after-dinner remarks that both complimented the department on its past achievements



Jon Reis Photography

President Hunter Rawlings addresses participants in a symposium celebrating the creation of the Department of Chemistry and Chemical Biology

*continued on page 7*

# In Memoriam: William T. Miller

The department is saddened by the death of Professor Emeritus William T. Miller. Professor Miller had been a member of the chemistry faculty since 1936 and was a key scientist on the Manhattan Project team that developed the atomic bomb in World War II. He was 87 at the time of his death on November 15.

In the late 1930s Professor Miller carried out research into the chemically resistant materials from which he later developed the chlorofluorocarbon polymer used in the first gaseous diffusion plant for the separation of uranium isotopes, a crucial factor in the development of the atomic bomb. The fissionable isotope Uranium-235 was separated from the more abundant isotope Uranium-238 by selective diffusion of uranium hexafluoride gas through barriers, or filters, made of the polymers he developed. U.S. Army Maj. Gen. Leslie R. Groves, the military leader of the Manhattan Project, personally commended Miller: "I wish to express my appreciation to you for the contribution you made to the development of the atomic bomb. The engineering research work you carried out resulted in the development of certain materials needed in the large production plant and was essential to our success." Professor Miller was also the discoverer of the facile reactivity of the fluoride ion with fluoroolefins and of the unique importance of the fluoride ion to carbon-fluorine chemistry. He later pioneered one-electron reactions of molecular fluorine with carbon.

William T. Miller was born in Winston-Salem, N.C., in 1911. He earned a bachelor's degree in 1932 and a doctoral degree in 1935, both from Duke University. The following year, he was a Lilly Fellow at Stanford University. In 1936, he came to Cornell as an instructor and retired as a professor emeritus of chemistry in 1977. Since that time he has continued to attend faculty meetings regularly and to provide the sage advice for which he has always been known.

Professor Miller played a key role in the development of our department. When then-chairman Harold Scheraga asked him to oversee the construction of the Olin Research Wing and the subsequent renovation of Baker Lab, he graciously accepted and began by visiting recently constructed chemistry buildings in order to identify a suitable architect. He decided that the best architect was WASA, the architectural firm that had also designed the chemistry building at Brookhaven National Laboratory.

The next problem was to convince the administration to allow this architect to bid on the project. The architect was not a Cornell alumnus and until then no non-alumnus had ever been selected to design a Cornell building. Professors Miller and Scheraga appeared before the administration, and Professor Miller's quiet but firm arguments ultimately carried the day.

A unique part of Professor Miller's plan for the building was a completely new style of teaching laboratory in which all students faced in the same direction, allowing the teaching assistant to stop the experiments at any time and face all the students to explain a procedure. Miller was very cautious about the laboratory design. Before allowing it to be incorporated into the final renovation, he arranged to have a mock-up built and tested for two semesters. The successful laboratory design was subsequently described in the literature.

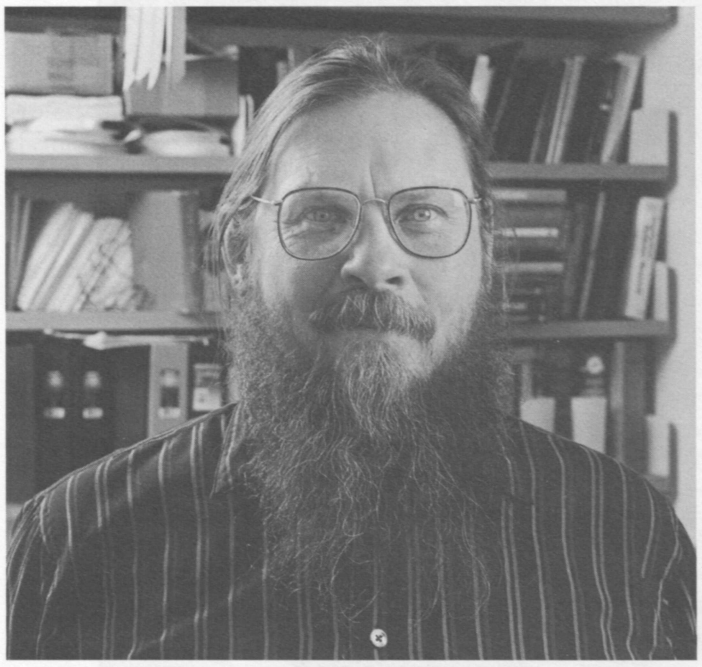
Professor Miller seemed as comfortable and knowledgeable in talking with heating engineers as in discussing organic chemistry with his colleagues. By working closely with his colleagues in industry, he was able to obtain construction materials of far greater quality and at far lower cost than anyone else could have done. For example, he procured acid-resistant stainless steel duct work for the Baker Laboratory teaching labs at a price just a few thousand dollars more than we would have had to pay for much-inferior galvanized material.

All those who knew him agree that Professor Miller was a southern gentleman in the finest sense of the word: always concerned with the human dimension within the otherwise professional space that we all shared. He was a person of high moral standards and ethics. He firmly believed, for example, that we should not short-change graduate students by asking them to take easy courses, even though it might curry their favor. He was thus the only organic professor who made his graduate students take physical chemistry. Fred McLafferty, who was his student, can attest to Professor Miller's rigorous graduate standards.

Harold Scheraga describes how Professor Miller was helpful to him as a young instructor. "Perhaps it was because we were both Duke alumni or perhaps just because he was a nice guy, but he was very encouraging to me, letting me know how important all aspects of the job, teaching and department service as well as research, were for ultimate success (and tenure) at Cornell. He would pop in frequently to my office or lab just to be friendly and encouraging."

In 1974, Miller received the American Chemical Society award for Creative Work in Fluorine Chemistry, and in 1986 in Paris he was awarded the Moissan Centenary Medal in honor of Henri Moissan who discovered the element fluorine in 1886. He was a member of the American Chemical Society and the Royal Society of Chemistry of Britain. In his spare time, he loved growing things that require a challenge, such as his prized grapes and English walnuts.

He is survived by his wife of 47 years, Betty Robb Miller; his brother, Robert L. Miller, of Panama City, Fla.; his nephews Robert Miller, of Belfast, Northern Ireland, and Richard Miller, of Grosse Point Farms, Mich.; and his niece, Katherine Johnston, of Opelika, Alaska.



# Steve Ealick Brings His Expertise to the Department

Steven E. Ealick, a native of Ponca City, Oklahoma, pursued his B.S. degree in chemistry at Oklahoma State University and received his Ph.D. in physical chemistry from the University of Oklahoma. His thesis work involved X-ray crystallographic studies of marine natural products and synthetic compounds having biological activity. Following his doctoral work he became a postdoctoral fellow at the California Institute of Technology where he continued his studies in small-molecule crystallography focusing on molecules that reversibly bind molecular oxygen. After completing his studies at Caltech, he continued his postdoctoral work at the University of Alabama at Birmingham where, as an NIH postdoctoral trainee, he became involved in protein crystallography. Over the next few years he determined several new protein structures, including a neurotoxin from scorpion venom, the salvage enzymes, purine nucleoside phosphorylase and thymidine phosphorylase and the cytokines, interferon-gamma, interleukin-4, and granulocyte-macrophage colony stimulating factor. He became a Special Fellow of the Leukemia Society and later a Leukemia Society Scholar. When he left Alabama to join the Cornell faculty, he was associate professor of biochemistry and pharmacology and associate director of the Center for Macromolecular Crystallography.

At Cornell, Ealick joined the Section of Biochemistry, Molecular and Cell Biology and was named director of the Macromolecular Crystallography Resource at the Cornell High Energy Synchrotron Source (MacCHESS). He continued his studies in X-ray crystallography and developed new methods and instrumentation for applications of synchrotron radiation to biological crystallography. In addition, Ealick served as chair of Biochemistry, Molecular and Cell Biology before joining the Department of Chemistry and Chemical Biology this fall.

Ealick has developed an active program in structural biology and has published about 140 papers. He has also developed two new courses at Cornell. Chem 233 is a course in biomolecular structure aimed at undergraduates. The course makes use of 3-D stereographics and is aimed at teaching students how to relate structure to function for biologically important molecules. The second course, Chem 788, is a graduate-level course in macromolecular crystallography and covers both theoretical and practical aspects of X-ray diffraction.

At Cornell, Ealick studies the three-dimensional structures of protein molecules using X-ray crystallography. The X-ray structures can be used to understand catalytic mechanism, to design enzyme inhibitors that might be useful as drugs, and to engineer enzymes with novel activities. Much of his work focuses on enzymes involved in purine and pyrimidine nucleotide metabolism. These enzymes are a rich source of targets for the design of anticancer and antiviral drugs. Currently, Ealick studies enzymes in the purine and pyrimidine salvage pathways, the purine and pyrimidine biosynthetic pathways, the polyamine biosynthetic pathway, and the thiamine biosynthetic pathway. He is involved in several collaborations with drug companies as well as collaborations with Professors Bruce Ganem and Tadhg Begley.

Most of Ealick's work focuses on crystallographic analysis. His group has set up facilities for cloning, overexpression, and purification of proteins. Protein crystallization; X-ray diffraction studies; and molecular graphics and modeling.

At MacCHESS, his group uses the intense, tunable X-ray beams for macromolecular crystallography. His group is also involved in the development of instrumentation and techniques that are then made available to members of a national user community that visits MacCHESS on a regular basis.

In the future, Ealick hopes to combine X-ray crystallographic studies with information from the genomics initiative to better understand protein structure, function, and evolution. Eventually, these studies should help in identifying new drug targets, novel protein folds, new catalytic mechanisms, and evolutionary relationships between protein families. These studies provide a basis for many campus-wide collaborations and integrate well into the department's new initiative in chemical biology.

# Seeking Perfection: Researcher Aims at Flat Surfaces without Bumpy Atoms

*David Brand, Cornell News Service*

Melissa Hines is a researcher in search of perfection. Her goal is a mirror surface on which not even a single atom is protruding above the surface.

"There is no theoretical reason why you can't make things that are perfect," said Hines, assistant professor of chemistry. "It was once thought there were no mechanisms for perfection". But within the next five years she expects researchers to be able to produce silicon surfaces that "are essentially totally flat."

Hines described her work in understanding perfection at the 1998 annual meeting of the American Physical Society in Los Angeles. On April 1 she and her Cornell colleagues addressed scientists at the annual national meeting of the American Chemical Society in Dallas.

Hines' research, which she began as a postdoctoral student at Bell Labs, is of great economic importance to the semiconductor industry because surface roughness, even on the atomic scale, can greatly decrease the performance of a transistor. "As we go down to smaller and smaller devices, roughness becomes a larger and larger problem," Hines said.

The possibility of surface perfection was serendipitously discovered about five years ago when Bell Labs researchers sought a new method of removing dust from the silicon wafers used to produce integrated circuits. The old method, developed in the 1960s, involves washing the silicon wafers in basic peroxide baths. But today's much smaller circuitry develops atomic-scale roughness from the chemical, significantly reducing the transistor's performance.

But by changing the acidity and composition of the chemical solution, the researchers discovered they were able to produce small areas on the silicon surface that were totally flat, even at the atomic level. In fact the surface roughness was equal to only one protruding atom out of every 30,000 surface atoms.

However, this perfection is only reproducible on one type of silicon surface, called silicon (111), which is a different plane from the silicon (100) used for integrated circuits. Thus, said Hines, the goal of research is to find chemical solutions that will produce perfection on different surfaces. To do this, she said, it must first be understood how the chemicals used in her research, a basic hydrofluoric acid solution, etch away protruding atoms. "At this point we know what is going on," she said. "Next we have to change the chemistry to control the reactions."

The most perfect surface Hines and her colleagues have achieved to date appears through the electron tunneling microscope as a series of steps, with every step only a single atom high. The steps are the result of almost imperceptible errors in cutting the silicon wafer. Because of the chemical action, each step is evenly spaced and almost straight.

Another dramatic example of surface chemistry is the production of equilateral triangles. In this case, the chemicals appear to burrow into small defects on the silicon surface, each a few atoms across, and then open the defects out into triangles about 1,000 atoms across. The bottom of each triangle is perfectly flat. "This had us confused for a very long time," said Hines. "It turns out there is an atomic defect in the crystal that is very reactive. When etched, the atomic structure becomes triangular."

Hines marvels at the chemical reactions that produce both the flat surfaces and the triangles. In both cases, the chemicals etch away surface atoms, one atom at a time, in a very precise order. She calls the process "unzipping," because neighboring atoms

are etched in a sequential fashion in much the same way that teeth in a zipper are sequentially opened. It is this type of reaction that Hines is seeking to control in her quest for perfect surfaces.

The technique has many uses, she said. In addition to integrated circuit technology, the chemistry would be useful in micromachining of very small parts in which nanoscale control of manufacturing is essential. These chemistries, Hines said, could be applied not only to etching patterns in material but also to applying thin films.

"The nice thing about chemistry is that it does all this automatically," she said. "It's not as if you had to build a machine that removes one atom at a time."

The title of Hines' talk at the American Physical Society was "Towards Chemical Control of Surface Morphology: Aqueous Etching of Silicon." The title of her talk at the American Chemical Society was "The Unexpected Role of Etchant Diffusion in Autocatalytic Etching of Si(111)." Her collaborators in the Chemistry and Chemical Biology are Yi-Chiau Huang, Jaroslav Flidr and Theresa A. Newton.

This work was supported by the Beckman Young Investigator Program and by the National Science Foundation.

# Researchers: Clever Chemistry Keeps Trend-Setting Beetle Babies Off Menu

*Roger Segelken, Cornell News Service*

Naked, immobile, and conspicuously colored, the squash beetle pupae would be easy picking for insect predators if they hadn't long ago perfected a science called combinatorial chemistry. In the human world it is a chemical skill that pharmaceutical researchers are still learning.

By variously combining three simple molecules into a veritable arsenal of complex defensive compounds and secreting them through microscopic body hairs, *Epilachna borealis* pupae can thwart just about anything that would eat them, Cornell researchers reported in the July 17 issue of the journal *Science.*

"Industrial chemists have only begun practicing combinatorial chemistry in the last five years. They generate a very large number of variations on one architectural theme and test a library of compounds very rapidly for pharmaceutical activity with high-throughput screening," explained Jerrold Meinwald, the Goldwin Smith Professor of Chemistry, who is one of six authors of the *Science* article.

"This beetle pupa does the same thing, creating hundreds of deterrent compounds from three simple precursors," Meinwald added. "Then it skips the screening process in the laboratory and goes straight to the field where the ultimate test is its survival in a bug-eat-bug world."

One of the hundreds of different chemicals produced by *E. borealis* is a necklace-like structure of 280 atoms forming one single large ring.

With no other defenses than this, the beetle pupae are rarely disturbed. Hungry ants, for example, are quickly repulsed by the pupal chemicals and frantically clean the noxious substances from their antennae with special brushes on their forelegs.

Within a few days, the pupae metamorphose into adult squash beetles—and in the process become an agricultural nuisance.

"How this creature survived had been a real mystery," said Thomas Eisner, the Schurman Professor of Chemical Ecology, and an author of the journal article. "It is bright yellow on the background of green leaves, it has no mechanical defenses, and it is exposed to anything that comes around, particularly aggressive ants."

The pupae of some beetle species defend themselves, Eisner explained, with mandible-like contraptions on their abdomens. By wiggling their abdomens, the pupae usually manage to pinch the legs or antennae of attacking insects and thus survive into adulthood. But *E. borealis* pupae have no such mechanical defenses, so Eisner looked a little closer. Viewed through the microscope, the pupae are seen to have fine body hairs topped by glistening droplets of chemicals.

A series of analytical investigations (including nuclear magnetic resonance spectroscopy and high-pressure liquid chromatography) performed by Frank C. Schroeder, a postdoctoral researcher at Meinwald's laboratory, revealed the unprecedented complexity of the beetle's defenses. Jay J. Farmer, a graduate student, confirmed Schroeder's structural assignments by synthesizing one of the most important of the large-ring compounds.

"One of the most exciting features of the beetle pupae's defensive chemicals is the sheer magnitude of the rings," Schroeder said. "Ordinary cyclic natural products often have rings consisting of five, six, or even seven atoms. Compounds with rings of 30 or 40 atoms can already be considered very rare. The discovery of a whole library of novel compounds with ring sizes from about 30 to well over 200 atoms was, therefore, entirely unexpected."

And yet the beetle pupae use simple chemistry to produce these unusual compounds. Three different small building blocks related to ordinary fatty acids are used to assemble the rings. Many different combinations of the building blocks then create a highly complex mixture, a library of large rings.

The defensive chemicals can be seen under high magnification. The tiny insect pioneered an endeavor in which human chemists, with their costly and sophisticated machines, only now hope to succeed.

Combinatorial chemistry has yielded several drugs that are expected to reach the marketplace in the near future. An estimated one-tenth of the approximately 1,900 biotechnology companies worldwide are believed to be using the approach in their research-and-development programs.

"Each time we find a new talent in the insects we study, we are brought to wonder about treasures that remain unknown. After all, most insects remain to be discovered," Eisner said.

The *E. borealis* studies by Meinwald, Eisner, Farmer, and Schroeder, who worked with Scott Smedley and Athula Attygalle, postdoctoral associate and senior research associate, respectively, were supported by grants from the National Institutes of Health and the National Science Foundation.

*Chairman's Notebook, continued from front page*

and challenged us to extend our success into chemical biology.

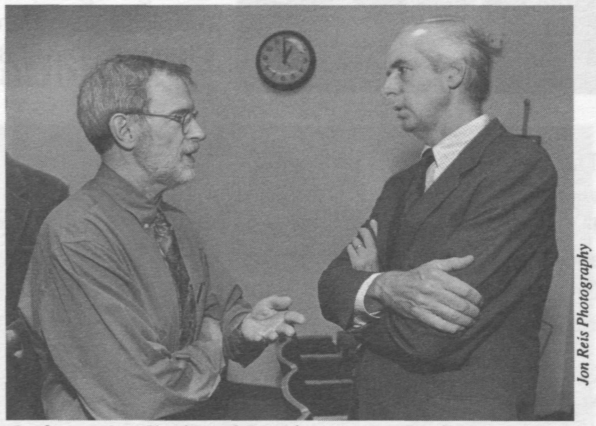
This will be a challenge. If we are to grow at our planned rate, we will need not only to make wise hiring decisions but also to provide competitive research support and laboratory space for our new faculty. Baker and Olin laboratories will not be sufficient to house the expanded faculty; thus it is likely in the long term that a new research wing will be required. In the shorter term, we will need to renovate and make more efficient use of the space we have.

Will we find the resources necessary to accomplish our goals? President Rawlings, in closing his introduction to the symposium, reminded us of a verse from Proverbs: "A good name is rather to be chosen than great riches." He went on to say, "I congratulate the Department of Chemistry and Chemical Biology for the good name it has chosen—and I wish it great riches as a consequence of that choice." We hope his wish comes true.

*–Paul Houston*

# Rawlings Affirms Dedication to Further Chemistry and Chemical Biology at CU

*David Brand, Cornell News Service*



Jon Reis Photography

Professor Jon Clardy and President Hunter Rawlings

Cornell's newest department, Chemistry and Chemical Biology, once known merely as "Chemistry," celebrated its name change September 12 with a day of lectures on the forefront of research in, appropriately, chemical biology. It is the first name change for the department since it was separated from physics in 1880.

The day began with a welcome from President Hunter Rawlings and ended with an after-dinner speech embodying wit and wisdom from President Emeritus Frank H. T. Rhodes.

In between, three eminent researchers discussed their research in a field that will increasingly occupy the time of the department's labs, and that, chair Paul Houston said, indicates the increasing importance of the interface between chemistry and biology. It is a field in which, Rawlings observed, "we intend to grow and intend to invest and remain at the forefront." Indeed, he said, that investment will include hiring new faculty from outside "who will invigorate the science."

The symposium was led off by Wayne Hendrickson of Columbia University's Department of Biochemistry and Molecular Biophysics, who discussed the molecular mechanisms used by the human immunodeficiency virus (HIV) in cell entry and immune invasion. Hendrickson explained that at the heart of HIV's devastation is its subversion of the way in which the immune system cell, the T-helper, is able to recognize antigens. Without this recognition ability, the cell is unable to destroy invaders.

An important factor in the T-cell recognition process, said Hendrickson, is a molecule called CD4 (for cluster determinant number 4). However, he said, HIV has evolved in such a way that it takes over the CD4 function "so that CD4, which is a receptor in the immune system response, becomes a receptor for the virus." The first action of the virus is to bind to the CD4 molecule to gain entry to the immune system.

"This virus has the need to avoid all of the immune system machinery, and it does it in a way that is beyond the characteristics of other viruses we have seen before," Hendrickson said. When HIV becomes part of the cell, it mutates very quickly. "Consequently there are many different strains of the virus, and those will not be recognized by the immune response developed against the previous strain. As a consequence, the virus is able to avoid or evade the whole immune discovery system of the body."

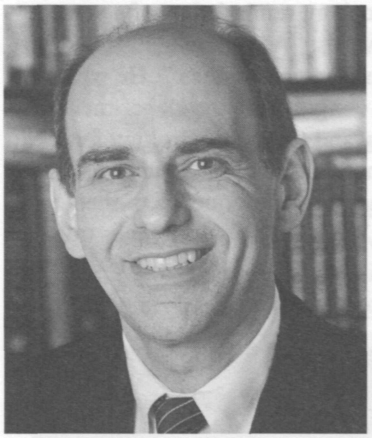
The problems facing the chemical biologist, said Hendrickson, are in molecular recognition and involve understanding how molecules interact with each other. The goal, he said, is to discover the detailed chemical bases at work in subverting the body's ability to provide protection against the HIV invader.

Ultimately, he said, the hope is to develop drugs that might block the invasion process and of producing appropriate vaccines to protect the immune response.

Hendrickson was followed by Joanne Stubbe of the Department of Chemistry at the Massachusetts Institute of Technology, who discussed "The Importance of Transient Protein-Protein Interactions in Metabolism," and by Stuart Schreiber of the Department of Chemistry and Chemical Biology at Harvard University, who spoke on "Discovering and Using Small Molecules for Chemical Genetic Research."

The day ended with a reception and dinner, following which Rhodes told the guests, "In an age where knowledge is the new economic currency and science is the driving force of knowledge itself, the universities must prosper if the nation itself is to prosper."

Knowledge, he said, is the basis of every venture there is. "But knowledge, unlike other natural resources, is also catalytic: It expands even as it is consumed. It is refined even as it is challenged and tested. It comes only, however, to the prepared mind. It is not a free good. And it is only universities that can continue to create and to provide and to translate knowledge in a meaningful way."



# Ganem Receives Johnson & Johnson Award to Support Chemical Research

*David Brand, Cornell News Service*

Johnson & Johnson, the multinational medical products concern, has again shown its support of Cornell research by awarding a $270,000, three-year grant to Bruce Ganem, the Franz and Elisabeth Roessler Professor of Chemistry.

This is the fourth time the company has made awards to Cornell researchers under its Focused Giving Program, established in 1980 to stimulate exploration in medical science. Previous recipients were Harold Scheraga, the George W. and Grace L. Todd Professor Emeritus of Chemistry, David B. Collum, professor of chemistry, and Fred B. Quimby, professor of veterinary pathology.

The first installment of Ganem's award was presented July 16 by Johnson & Johnson researchers Pallassana Narayanan and Peter J. Connolly and by Susan Greger of the company's office of science and technology.

Cornell's director of corporate relations, Nick Komanecky, noted that the award originated with a visit to the campus last September by 18 Johnson & Johnson scientists. During the visit, hosted by President Hunter Rawlings, faculty members, including Ganem, described their research, from drug delivery to diagnostics.

Ganem, who joined the Cornell faculty in 1974, also serves as the J. Thomas Clark Professor of Entrepreneurship at Cornell for the period through June 30, 2000. He is a specialist in the emerging interfaces of organic and biological chemistry with biochemistry, biotechnology, and molecular medicine. His recent Cornell research has involved the use of organic synthesis, structure-based drug design, protein engineering, and biotechnology to study biological pathways.

The basic research proposed in the Johnson & Johnson grant, Ganem says, involves using organic chemistry to try to develop medical advances, such as new test strips or medical tests or even new drug delivery systems.

"The buzzword is 'create smart surfaces' — surfaces that will respond to fluids in the body," Ganem said. Such products will be part of what he calls "the new wave of miniaturization." Although he is "still in the learning phase of nanofabrication," Ganem and his students will be working closely with the Cornell Nanofabrication Facility as well as with Johnson & Johnson scientists.

Under the terms of the agreement, Cornell will own any patents that might result from the research, but the company will have the right to license any patent.

## Ganem, One of Five Named Clark Professors of Entrepreneurship and Personal Enterprise

*excerpted from an article by David Brand, Cornell News Service*

Five limited-term, renewable appointments to the J. Thomas Clark Professorships of Entrepreneurship and Personal Enterprise were reported to the Cornell Board of Trustees at its March 1998 meeting.

J. Thomas Clark '63, MBA '64, and Nancy W. Clark '62, M.Ed '64, created a fund in 1992 to provide for the establishment of the J. Thomas Clark Professorships. The professorships encourage faculty members in any of the 11 schools and colleges on campus to develop and teach innovative courses or to fund research and executive education offerings that relate to launching and managing a business. The Clark endowment features flexible appointments that foster participation in the Entrepreneurship and Personal Enterprise program by faculty members and students of all schools and colleges on campus and gives the program a vehicle for responding quickly to ever-changing business trends and student needs.

Bruce Ganem, currently the Franz and Elisabeth Roessler Professor of Chemistry, will hold the Clark professorship from July 1, 1998, through June 30, 2000.

Ganem's recent research at Cornell has involved the use of organic synthesis, structure-based drug design, protein engineering, and biotechnology to study biological pathways. For example, to understand how aromatic compounds are biosynthesized in plants and micro-organisms, he has focused on chorismate mutase, an enzyme that plays no part in mammalian metabolism and is thus an attractive target for the development of new rationally designed herbicides and antibiotics.

Ganem has been an Alfred P. Sloan Research Foundation Fellow and a John Simon Guggenheim Memorial Foundation Fellow. He is a recipient of the Camille and Henry Dreyfus Teacher-Scholar Award and the Clark Teaching Award at Cornell. He has been active as a consultant to several major drug companies and currently serves on the scientific advisory boards of three biotechnology companies.

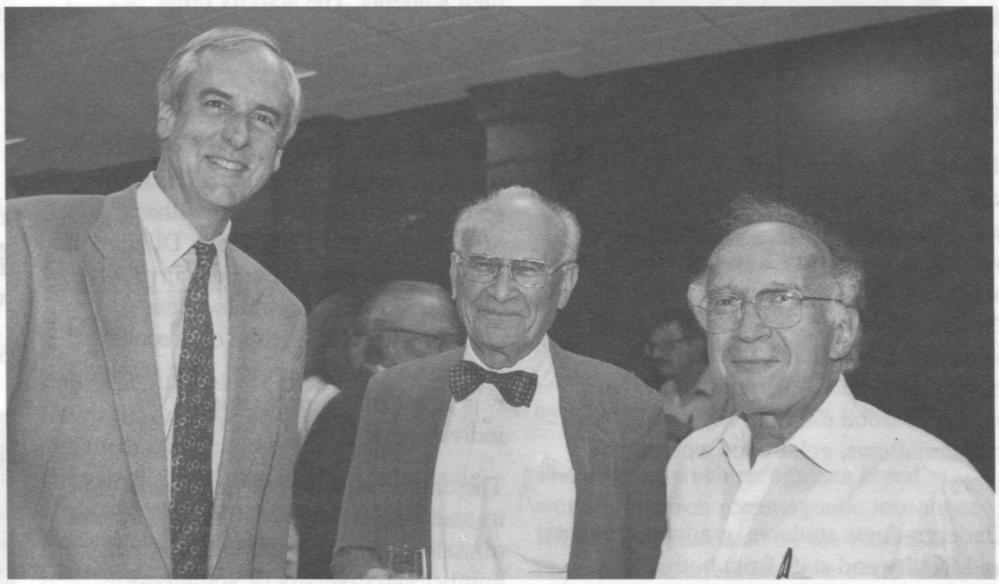
For the Clark Professorship program, Ganem will be developing a new one-credit course on entrepreneurship in the chemical, pharmaceutical and biotechnology industries, including start-up ventures and new business development in existing companies.

## Executive Editor

Bruce Ganem has also been named executive editor of *Tetrahedron Letters.* The weekly international journal of chemistry is published by Elsevier Science Ltd. Ganem also will become a member of the executive board of editors of Elsevier's chemistry journal group, called Tetrahedron Publications. *Tetrahedron Letters* was first published in 1959 by its founders Sir Robert Robinson and R. B. Woodward. It is the leading international journal for the rapid publication of research results in organic chemistry. Ganem, an expert in organic synthesis and bioorganic chemistry, joined the Cornell faculty in 1974 and served as department chair from 1993 to 1997. He succeeds H. H. Wasserman of Yale University, who served as executive editor of *Tetrahedron Letters* for 35 years.

# 1,000 Scheraga "Hits" Honored at Celebration

*David Brand, Cornell News Service*



President Hunter Rawlings, Harold Scheraga, and Roald Hoffmann

One thousand published research papers is akin to a baseball player knocking out more than 3,500 hits. For Professor Harold A. Scheraga, it is a score that encompasses a lifetime of research, beginning with his first paper in 1948.

In June of this year, Scheraga's achievement was the occasion for a celebration at Baker Laboratory, at which President Hunter Rawlings hailed the internationally celebrated biophysical chemist as achieving "a remarkable combination of quantity and quality." Said Scheraga, who is the George W. and Grace L. Todd Emeritus Professor of Chemistry, "I am overwhelmed by all this attention."

To signal Scheraga's latest paper in a marathon of publishing, which Rawlings whimsically called his "10-to-the-third publication," the department's faculty, staff, and graduate students, past and present, presented Scheraga with framed side-by-side copies of his first and latest papers. And another gift, an engraved crystal, carried the inscription "1,000 and Counting."

Scheraga's latest paper appeared earlier this year in the publication *Biochemistry,* published by the American Chemical Society. It concerned the influence of phosphorylation on the binding of fibrinopeptide A to bovine thrombin. It was published in conjunction with colleagues at Cornell and at the University of California, Irvine.

This was a long journey from Scheraga's first paper, published in 1948 in the *Journal of the American Chemical Society,* on the thermal chlorination of benzal chloride. The research paper was part of Scheraga's thesis submitted for his doctorate, awarded by Duke University in 1946.

At the time of the publication, Scheraga was an instructor of chemistry at Cornell. He became an assistant professor in 1950, a full professor in 1958, the chair of the chemistry department in 1960, and he was named the Todd professor in 1965. He became an emeritus professor in 1992.

As Rawlings noted, four of Scheraga's papers have been designated as "Citation Classics" by *Current Contents*, a publication of the Institute of Science Information. The magazine once calculated that Scheraga was the most frequently cited physical chemist in the world. (He is still among the top 1.7 percent of those chemists regularly cited.)

Much of Scheraga's research involves describing protein structure in solution. In early investigations, his concern was the size and shape of the protein molecule. More recently his research has focused on the internal interatomic interactions that dictate how a protein folds in water.

Said Scheraga at the reception, "I still get excited about science. I'm not stopping at 1,000."

# Cornell Section Receives ACS Phoenix Award

*Saundra McGuire*

The Cornell Section of the American Chemical Society received the runner-up prize for the Phoenix awards at the fall ACS meeting in Boston. There were five finalists (out of a possible 187 local sections) in the area of best mall event, and the Cornell section came in second in the nation for its "National Chemistry Week Celebration" at Pyramid Mall in Ithaca, N. Y. on Saturday, November 1, 1997.

The event, which attracted adults and children of all ages, was held from 10:00 a.m. until 5:00 p.m. and provided a wide variety of demonstrations and hands-on activities. Twelve exhibit tables were "chemically alive" with cabbage juice indicator experiments, slime, frozen banana hammers, floating bubbles on a layer of carbon dioxide, expanding marshmallows, gelatinous worms, and more!

Undergraduate students, graduate students, and faculty and staff from both Ithaca College and Cornell University departments of Chemistry, Chemical Engineering, Textiles and Apparel, and Food Science were on hand. Members and non-members of the ACS participated, as well as student members of the Cornell Chemistry Club, Ithaca College Chemistry Outreach Club, and Alpha Chi Sigma. In addition to the tables of experiments and demonstrations, an information table served to provide shoppers information about the significance of National Chemistry Week and to give out buttons, periodic tables, and copies of "Planet Chemistry." The 10 activities were entitled Colors to Dye For, Polyester from Recycled Soda Bottles, Fun with Chemistry, pHun with Chemistry, Floating Soap Bubbles and Expanding Marshmallows, Chemical Clocks, Cool Chemistry, Food Chemistry—Spooky Worms, Chemical Engineering of Polymers, and Floaters and Sinkers. The information table was labeled Do Chemistry, Get Stuff.

Mall shoppers, both young and old, were fascinated by the demonstrations, and were very appreciative of the opportunity to participate in the hands-on activities. Several students made comments such as "This is really neat!" and "This is really cool!" while in the process of performing the activities. Parents and teachers commented on the great learning experience the event was providing for their students. The activity drew approximately 500 visitors, many of whom were visiting Ithaca for Parents' Weekend at Cornell University.

The following weekend, on November 9, the local section presented a chemical reactions extravaganza at the Ithaca Sciencenter. Professor Frank DiSalvo did a series of chemical reactions involving oscillating reactions, luminescent reactions, etc. for a group of precollege students and their parents. The session was attended by approximately 50 individuals.

The unique aspect of the mall event was its size (approximately 1,000 square feet of mall space was occupied) and the number and diversity of volunteers involved. Approximately 70 volunteers staffed the 12 tables in shifts throughout the day. At the end of the day all of the volunteers were exhausted but exhilarated by the outstanding success of the event.

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# 1999 ACS Awards

The American Chemical Society has announced that **Benjamin Widom** has won the ACS Award in Theoretical Chemistry. The award, sponsored by IBM Corporation, was established in 1991 to recognize innovative research in theoretical chemistry that either advances theoretical methodology or contributes to new discoveries about chemical systems.

**Barry Carpenter** has won the James Flack Norris Award in Physical Organic Chemistry. The award was established in 1963 by the Northeastern Section, ACS, in commemoration of James Flack Norris. It is maintained from the income of the section's Norris Fund and is awarded to encourage and reward outstanding contributions to physical organic chemistry.

**Harold Scheraga** has won the Ralph F. Hirshmann Award in Peptide Chemistry. Sponsored by Merck Research Laboratories, the award was established in 1988 to recognize and encourage outstanding achievements in the chemistry, biochemistry, and biophysics of peptides.

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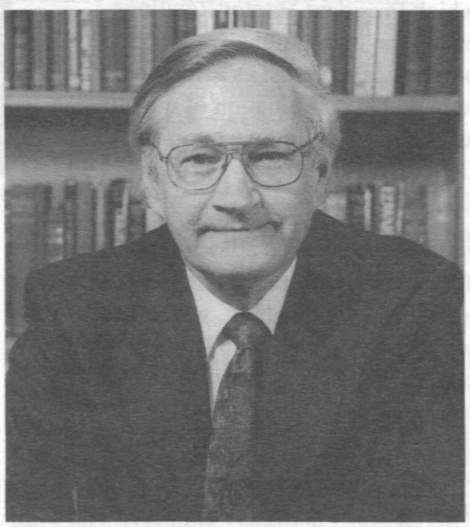
# A. D. White Professor-at-Large Visits Department

*Susan Lang, Cornell News Service*



Richard Ernst, 1991 Nobel laureate in chemistry and professor at the Swiss Federal Institute of Technology in Zurich, visited Cornell University October 14–29 as an A. D. White Professor-at-Large.

During his visit, Ernst gave six public lectures which were presented on several dates between October 14 and October 29: "The Fascination of Nuclear Magnetic

Resonance (NMR) in Physics, Chemistry, Biology, and Medicine;" "The Potential of Multi-Dimensional NMR;" "Intramolecular Dynamics Studied by NMR;" "Looking Inside Solids by NMR;" "Exploring Polymers by Spin Diffusion and Polarization Transfer;" and "Hydrogen Dynamics in Liquids and Solids Explored by NMR."

His Cornell hosts were Jack Freed, professor, and Earl Peters, executive director of Chemistry and Chemical Biology.

"Ernst must be counted in a small and unique group of twentieth-century physical scientists whose research achievements have directly revolutionized many fields, including chemistry, physics, engineering, biology, and medicine," said Freed. "One of his most famous and revolutionary achievements, for example, is the development of the Fourier Transform method of performing NMR, which Ernst so beautifully showed to have much-enhanced sensitivity and is now at the heart of all modern NMR spectrometers found in chemistry, physics, engineering, biology, and medical laboratories the world over. His introduction of Fourier Transform methods for magnetic resonance imaging (MRI) has been a keystone in the development of this extremely important modern medical instrument for both clinical use and medical research.

"His most distinguished pioneering contribution, however, includes the introduction of two-dimensional NMR and its extension to three and higher dimensions, which have greatly enhanced resolution of spectroscopy. This led Ernst and his colleague, Kurt Wüthrich, to develop the extremely important technique of determining the detailed structure of proteins in their normal environment in aqueous solution," Freed said.

Ernst, the co-author of *Principles of Nuclear Magnetic Resonance in One and Two Dimensions* (often referred to as the "New Testament of NMR"), is the recipient of many honors, including numerous honorary doctorates and the Wolf Prize for Chemistry, the Ampere Prize, and the Benoist Prize.

The A. D. White Program for Professors-at-Large began in 1965 to bring distinguished scholars to the Cornell campus for formal and informal exchanges with faculty and students. Up to 20 professors-at-large are named at Cornell at any one time. They make periodic visits to campus over six-year terms and are considered full members of the Cornell faculty. Their efforts enrich the lives not only of faculty but of students; in addition to giving public lectures, professors-at-large participate in office hours, seminars, and thesis consultations with undergraduate and graduate students.

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# Baker Lectures, Fall 1998

The fall 1998 Baker Lecturer was John Brauman, the J. G. Jackson—C. J. Wood Professor of Chemistry at Stanford University. Brauman, a physical organic chemist, gave an engaging series of lectures entitled, "Gas-Phase Ionic Chemistry." In 10 lectures he led us through sometimes simple but always elegant experiments to discuss topics as diverse as intermediates and transition states, energy transfer, proton transfer reactions, and excited electronic state effects. Often highlighting the differences between gas phase reactions and the large effects of solvation in solution chemistry, the lectures covered a very broad range of molecular chemistry.

We all enjoyed an active social schedule with Brauman as well. His engaging sense of humor and loquacious personality guaranteed the success of those social events. Indeed, Brauman and I even engaged our passion for fishing on a few occasions. It was an exciting and rewarding visit all around.

*—Frank DiSalvo, Chair, Baker Lectures Committee*

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# Freed Wins Zavoisky Award

*David Brand, Cornell News Service*

Jack H. Freed, professor of chemistry, has been named the 1998 recipient of the Zavoisky Award, a prestigious recognition by an international panel of scientists.

The award, which recognizes Freed's work in electron paramagnetic resonance (EPR), was presented by the Kazan Physical-Technical Institute of the Russian Academy of Sciences, Kazan State University, Kazan, Republic of Tatarstan, at a scientific meeting held September 22–26, 1998.

EPR uses microwave spectroscopy to detect spin-state changes in substances containing unpaired electron spins. Typically the spin state changes can be induced by a few milliwatts of microwave power. The international awards committee cited Freed for being distinguished in his work in EPR "and, in particular, his contribution to multifrequency EPR studies of molecular motion in liquids and restricted media."

The award, given annually since 1991, is named for E. K. Zavoisky, who first discovered the EPR effect in Kazan in 1944. Notes Freed, "No one could have

dreamed then of the great range of application of the technique today in chemistry, physics, biology, material science, and medicine."

Freed, who joined the Cornell faculty in 1963, last year was awarded the American Physical Society's Irving Langmuir Prize in Chemical Physics for his work in the development of EPR.

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# MacCHESS

MacCHESS (the Macromolecular Crystallography Resource at the Cornell High Energy Synchrotron Source) is a facility for X-ray crystallographic studies of biological macromolecules and is run under the direction of Steve Ealick (see page 4). MacCHESS is one of only five facilities in the United States that is capable of providing high-intensity X-ray beams for X-ray diffraction and other experiments. The X-ray beams produced at MacCHESS are about 1,000 times more intense than the X-ray beams produced by conventional laboratory sources. In addition, unlike conventional X-ray sources, the X-ray beams are tunable and naturally collimated.

As result, synchrotron radiation plays a critical role in the determination of protein structures because crystals of proteins and other macromolecules tend to be small and weakly diffracting while having large unit cell dimensions. Two decades ago, synchrotron radiation was considered a novelty and was applied to only a small fraction of highly demanding projects. Some of the first synchrotron experiments were aimed at crystals of viruses that usually produce weakly diffracting crystals. Today, we have learned that every crystallographic study benefits from synchrotron radiation. Even in routine cases, higher resolution, greater accuracy, and faster throughput are made possible by synchrotron radiation.

Many of the advances in synchrotron radiation research have taken place at Cornell. MacCHESS was one of the first facilities to use multipole wigglers (special magnets that amplify the X-ray intensity) for protein crystallography. MacCHESS also pioneered the use of cryocrystallography in which crystals are flash frozen at liquid nitrogen temperatures to eliminate the decay that normally occurs in the intense synchrotron beam. MacCHESS also has been instrumental in the implementation of X-ray detectors that use charge-coupled devices, thus providing rapid readout and more accurate X-ray intensity data. More recently, MacCHESS has been involved in the development of a new technique called MAD-phasing. MAD, which stands for multiple wavelength anomalous diffraction, uses the tunability of the synchrotron beam to recover phase information by measuring data at several different energies. This method has largely eliminated the need for heavy atom methods, which often required years to achieve success.

MacCHESS is funded by the National Institutes of Health through the biomedical research resource program. Each year, more than 100 research groups visit MacCHESS to collect X-ray intensity data for various protein projects. During the past five years, this has resulted in more than 400 scientific publications, many in high-profile journals such as *Science, Nature* and *Cell*. MacCHESS recently submitted a five-year proposal to the NIH for continued funding of our research and development programs and our user facility. The proposal received a strong endorsement from the review panel, and this fall Cornell was awarded an $8.1 million grant to continue our program.

In the future, we plan to continue the development of new instrumentation and new methods for synchrotron radiation research. As structural biology continues to grow in importance, MacCHESS should be well positioned to make an impact in the field, and Cornell's Department of Chemistry and Chemical Biology should have a unique advantage in the development of biological research programs that depend on structural information.

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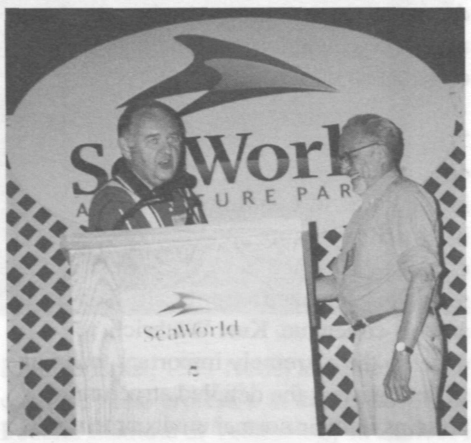
# Mobil Grant


In May 1998, David Blain of Mobil Corporation and his family visited the department and presented chair Paul Houston with a check for $10,000. The money is to be used at the discretion of the department to further academic and research programs.




Earl Peters, executive director, receives the Council for Chemical Research Perfect Attendance Award at the 20th annual meeting held in Orlando, Florida in September.

## Undergraduate Awards 1998

The **Leo and Berdie Mandelkern Prize** 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 Katherine Henzler, who is currently attending the University of Michigan at Ann Arbor.

The **George C. Caldwell Prize** is awarded annually to two senior chemistry majors who have shown general excellence. This year's recipients are Dori Engel and Peter Tsang.

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 recipients is Samuel Wang.

The **Merck Index Award,** which consists of a Merck Index with the name of the recipient imprinted in gold, is presented to two outstanding chemistry majors in the senior class. This year's recipients are Yoko Hori and Steven Milman.

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, Lawrence Low, receives an 8-month (16 issues) subscription to *Analytical Chemistry.*

The **Harold Adlard Lovenberg Prize** 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 Kurt Melstrom.

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 Mara Brandsdorfer, David Kastrinksky, and Lukshmi Kamat.

The **A. W. Laubengayer Prize** 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 Rachel Pessah, Michael Little, and Pakorn Kancahawong.

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## Commencement 1998

Sunday, May 24, marked the 130th commencement exercises at Cornell University. Graduates assembled at Schoellkopf Field, where President Hunter Rawlings spoke of the future. Immediately following the changing of the tassels, chemistry graduates, along with their families and friends, came to Baker Laboratory for a well-deserved celebration.

After a brief reception in the Baker lobby, a diploma ceremony was held in Baker 200, with chair Paul Houston addressing the guests and shaking the hand of each graduate. As the day came to a close, a group photo was taken, after which graduates began to go their own way. Best of luck to the Class of 1998.

### May Graduates

*Pierre Sayed Aoukar, Jeffrey Dana Benson, Mark Alan Breidenach, Kevin Roy Brown, Kyle Matthew Buza, Elbert E. Chang, Pep Charusanti, Raymond W. Song Chen, Hyejin Cho, Jennifer Chung, Daniel Martin Devine, Hooman Dilmanian, Andrew Jesse Engel, Dori Allison Engel, Alexander Garger, Elizabeth G. Gelfand, Juliette Rosella Gray, Katherine Anne Henzler, Yuko Hori, Joeye Tsung-Yi Huang, Raghu Idupuganti, Priya Shantu Kalwani, Beom-June Bryan Kim, Lynda Jin-Young Kim, Paul Moonwhan Kim, Joanna Ruth Kipnes, Parul Harish Kothari, Jonathan B. Kozinn, Nathan Alfons Kruger, Derek Jeremy Lam, Jamie Mercer Larmann, Alan I. Lee, Amy Tsai-Ting Lee, Norman Yi Chen Lee, Matthew Stephen Lefever, Brian Lima, Mark Richard Lustig, Shiho Makimura, Gregory N. Marques, Kusai Abid Merchant, Scott Christopher Meyers, Steven Milman, Ivan Jozef Oprencak, Emily Ann Peterson, John Matthew Pette, Murali Arul Ranjithan, Benjamin Eli Saltman, Aaron J. Sharma, Carlos Manuel Soto, Amy Lynn Speckhals, Michelle L. Sweet, Andrew Edmund Taggi, Kittichoat Tiyanont, Wing Cheong Peter Tsang, Mike Jochi Tsay, Kevin John Turneau, Mingke Wang, Samuel C. Wang, Julia Christina Wells, David I. Winger, Scott Evan Wolkenberg, Song Wu, David Yee*

### January Graduates

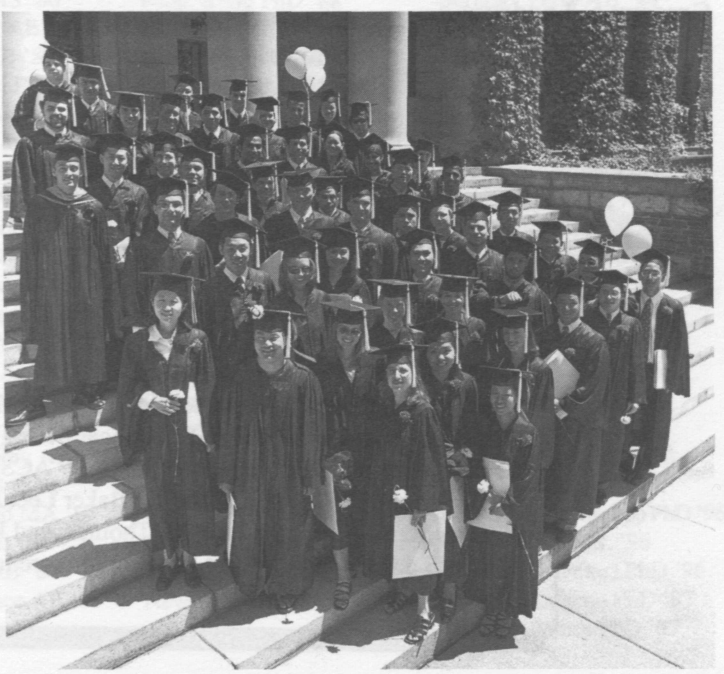
*Jenny Wei-Jun Chuang, Dane Arash Hassani, Jin Koo Kim, Dmitriy Markovich Kruglyak, Andrew J. Robinson, Jason A. Stein, Solana Nikee Stokes, Timothy Junius Triche Jr.*

### Graduating with Honors

Summa cum laude, *Katherine Anne Henzler, Dmitriy Markovich Kruglyak, Wing Cheong Peter Tsang, Scott Evan Wolkenberg*

Magna cum laude, *Dori Allison Engel, Yuko Hori, Brian Lima*

Cum laude, *Kyle Matthew Buza, Paul Moonwhan Kim, Nathan Alfons Kruger, Derek Jeremy Lam, Amy Tsai-Ting Lee, Kusai Abid Merchant, Ivan Jozef Oprencak, John Matthew Pette*



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 1998 are **Pamela Arnold, Tevye Celius, Jason Scull,** and **Douglas Weibel.**

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 quantity of their research. Prize winners present their research findings at an symposium held in the spring. This year's winners were **Christopher Jones, Jason Kirkwood,** and **Alan van Giessen.**

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 **Garegin Papoian.**

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 **Malvin Michelson-Thiery.**

# Graduate Degrees Awarded

## August 1997

**Lisa Jean Buller**
Professor Abruña

**Mark Frederick Harris**
Professor Usher

**Qing Huang**
Professor Meinwald

**Jinbao Jiao**
Professor Kramer

**Neil Lindstrom Kelleher**
Professor McLafferty

**Gregory A. Landrum**
Professor Hoffmann

**Robert Brian Nicewonger**
Professor Begley

**Peter Michael Radford**
Professor Meinwald

**Michael Jay Stimson**
Professor Albrecht

**Thomas Patrick Vaid**
Professor Wolczanski

**Grigori V. Vajenine**
Professor Hoffmann

**Shiying Zheng**
Professor Sogah

## January 1998

**Charles Brandenburg**
Professor Sogah

**Randal Claussen**
Professor Sogah

**Nancy Troy Harris**
Professor Baird

**Troy Kleckley**
Professor Wolczanski

**Anatoly Kolomeisky**
Professor Widom

**Palangpon Kongsaeree**
Professor Clardy

**Marc LeDuc**
Professor Fréchet

**Abds-Sami Malik**
Professor DiSalvo

**Keith William Pollack**
Professor Fréchet

**Kate Redmond**
Professor Carpenter

## May 1998

**Vincent Balbarin**
Professor DiSalvo

**Daniel Lorey**
Professor Morrison

**Rebecca Sendak**
Professor Baird

# Cornell Breakfast at the ACS Meeting in Anaheim

During the 217th national meeting of the American Chemical Society on March 21-25, 1999, the Department of Chemistry and Chemical Biology will host a continental breakfast for alumni and friends. Scheduled to be present are 1999 ACS national award winners Barry Carpenter, Harold Scheraga, Ben Widom; and former Baker Lecturers John E. Bercaw (also a 1999 ACS award winner), Jeremy R. Knowles, Sir John M. Thomas, and Richard N. Zare. Please join us on Tuesday, March 23, 7:45 a.m. in the Marriott Hotel. For more information on the ACS meeting, visit the ACS web site at www.acs.org.

# Missing Alumni and Friends

## Call for Help

The following excerpted list of alumni and friends is from our "Bad Addresses" file. If anyone knows how we might get in touch with someone listed, please contact Kelly Strickland at the address on the back page or via e-mail at kss1@cornell.edu.

Littman, Sandra PhD '60
Matsushita, Tatsuo AB '60
Rizk, Maurice PhD '60
Woo, Ching AB '60
Block, Arthur AB '61
Bottomley, Charles PhD '61
Gendell, Julien PhD '61
Hooper, N. AB '61
Kaufman, W. AB '61
Kiefer, John PhD '61
Lappeman, Myron AB '61
Aanning, Harald AB '62
Connolly, Donald PhD '62
Di Cyan, Adrian AB '62
Glen, Gerald PhD '62
Gross, Gary AB '62
Hymans, William AB '62
Kazaras, Michael AB '62
Maxey, Jr., Fred AB '62
Richard, Alan Vinton MS, 62
Schuster, Arnold AB '62
Tiensuu, Victor PhD '62
Weller, Paul PhD '62
Wepner, Franklyn AB '62
Wu, Anna AB '62
Cha, Chul-Yung PhD '63
Lombardi, John AB '63
Nealy, David PhD '63
Perry, John AB '63
Skloven, Z. AB '63
Tomboulian, Lawrence AB '63
Weber, Joann AB '63
Anderson, Alfred AB '64
Bailey, John AB '64
Comunale, Giuseppe MS, '64
Jernow, Jane '64
Mech, John AB '64
Schwartz, Alan AB '64
Szerenyi, Peter AB '64
Abdel-Rehim, Hosam MS '65
Arakawa, Tamid PhD '65
Naidich, Thomas AB '65
Perkins, Nancy PhD '65
Rauch, Erika AB '65
(Shaw) Dine, Ruth PhD '65
Snyder, James PhD '65
Lee, Byungkook PhD '66
Marsters, Gerald PhD '66
O'Donnell, Maureen PhD '66
Rietz, Richard AB '66
Younger, Peter AB '66
Butcher, Bruce AB '67
Durandetta, Donald PhD '67
Jesaitis, Raymond PhD '67
Klein, Alan AB '67
Rosenstein, Lee AB '67
Russo, Joseph AB '67
Zeiss, Geoffrey AB '67
Gaal, William PhD '68
Gould, Roy AB '68
Kelley, Robert AB '68
Martin, Thomas AB '68
Mitchell, Peter AB '68
Schulof, Richard AB '68
Simons, Peter AB '68
Torre, Joseph AB '68
Zavistoski, James PhD '68
Clericuzio, Carol AB '69
Gillette, Thomas AB '69
Kellogg, Ernest PhD '69
Lodoen, Gary PhD '69
Parker, Carol AB '69
Pines, Ira AB '69
Uno, Fumio PhD '69
Barnard, Thomas AB '70
Faeder, Edward PhD '70
Goldenberg, David AB '70
Kneezel, Lawrence '70
Leroy, Elsie PhD '70
Levine, Paul AB '70
Melander, Wayne PhD '70
Strayer, David AB '70
van Vuuren, Janse PhD '70
Fanso-Free, Samuel MS '71
Haidle, Rudy MS '71
Logigian, Eric AB '71
Mitlitzky, Janice AB '71
Wolfe, Mary AB '71
Buryan, Richard AGR '72
Cornelius, Dennis PhD '72
DeFranco, Robert PhD '72
Jones, Lawrence AB '72
Ostfeld, David PhD '72
Sennett, Margaret AB '72
Steger, John PhD '72
Allen, Barbara AB '73
Grant, William AB '73
Hirsch, David AB '73
Lehr, Timothy AB '73
Natowsky, Sheldon PhD '73
Ross, Maureen AB '73
Zimmer, Patrick AB '73
Haiby, William PhD '74
Heinsohn, George PhD '74
Horton, Christy AB '74
Nash, Eileen AB '74
Silberstein, Richard AB '74
Starobin, Joseph AB '74
Boxer, Matthew AB '75
Cooperman, Arthur AB '75
Gerbarg, Zachary AB '75
Hendley, III, Coit AB '75
Lim, Phooi BS CE '75
Nielsen, Norman PhD '75
Apple, David AB '76
Blanchard, William AB '76
Chen, Sen AB '76
Dejesus, Alain AB '76
Fine, Jeffrey AB '76
Hageman, Thomas PhD '76
McHale, Angelika PhD '76
Fay, Peter AB '77
Lovett, Susan AB '77
Chang, Alexander PhD '78
Seidman, Diane AB '78
Smith, Lucinda AB '78
Yuen, Maria PhD '78
Chang, Greta AB '79
Frank, Z. PhD '79
Graves, Lisa AB '79
Ho, Sa PhD '79
Jones, Brian MS ' 79
McClean, John AB '79
Murad, Sohail PhD '79
Parker, Charles AB '79
Plum, Christopher PhD '79
Sack, Roslyn AB '79
Schilling, Birgitte PhD '79
Smith, Gordon AB '79
Chang, Mary '80
Chiang, Raymond PhD '80
Coulter, Susan AB '80
Juenger, Martha AB '80
Mun, In Ki PhD '80
Sack, Christopher AB '80
Seewaldt, Victoria AB '80
Ticzon, Edgar MS '80
Walker, Derrick AB '80
Yang, Gilbert AB '80
Brickner, Steven PhD '81
Grant, Angela AB '81
James, Michael MS, 81
Ross, Elizabeth AB '81
Scott, Thomas PhD '81
Fredrickson, Robert PhD '82
Gonzalez, Prolongo PhD '82
Joseph, Nilufer AB '83
Kaussner, Andrea AB '83
Mohamadi, Fariborz PhD '83
Pulaski, Steven AB '83
Rendleman, Rebecca AB '83
Schneider, Nancy MS, 83
Stillerman, Audrey AB '83
Aguiar, Eric AB '84
Cortelli, Leonard MA '84
Latella, John AB '84
Nisco, Steven AB '84
Rigden, Lawrence AB '84
Baez, Pablo MS '85
Danis, Paul PhD '85
Eason, Robert MS '85
Kang, David AB '85
McGrory, Brian AB '85
Namboodiri, Sally AB '85
Nip, Tony AB '85
Park, Seong Ju PhD '85
Roach, Brady PhD '85
Twiss-Brooks, Andrea MS '85
Chin, Lawrence AB '86
Johnson, Leonie AB '86
LaPointe, Robert PhD, 86
Margolis, Eric AB '86
McPherson, Katherine AB '86
O'Bannon, Patrick AB '86
Shin, Alexander AB '86
Ting, Henry AB '86
Vogel, Peter AB '86
Zhao, Yuzhen MS AGR '86
Bernstein, Nathan AB '87
Burn, Joanne AB '87
Carnahan, Edmund AB '87
Collister, Donna MS '87
DeKay, Michael MS '87
Fakheri, Farzad AB '87
Grossman, Ofer AB '87
Hermans, Frisco MS '87
Jeon, Seung Joon PhD '87
Kopita, Jonathan AB '87
Martin, George AB '87
Moasser, Bahram AB '87
Morrison, Chetley AB '87
Moynihan, Denis AB '87
Murch, Bruce PhD '87
Park, Eun Kyung MS '87
Salzberg, Susan AB '87
Reese, Jaimie PhD '87-90
Elam, Jeffrey AB '88
Eurenius, Kirsten AB '88
Feng, Rong PhD '88
Guneratne, Ranil PhD '88
Kim, Scott AB '88
Lewis, Jonathan MS '88
Singh, Mona MS '88
Tyler, Stephen PhD '88
Yuan-Kai, Zhengyu PhD '88
Chang, Soo-Ik PhD '89
Choi, Chang AB '89
Kim, Eugene PhD '89
Kozlowski, Marisa AB '89
Labrecque, Gary PhD '89
Meyers, Lawrence AB '89
O'Brien, William PhD '89
Richardson, Jr., Robert PhD '89
Schneider, David PhD '89
Brown, Anthony AB '90
Chau, Minh Hang AB '90
Hasenyager, Jennifer AB '90
Morss, Sydney AB '90
Muecke, William AB '90
Newman, William MS, '90
Ruyin, Ruby MS '90
Skolnick, Eric AB '90
Torres, Fernando AB '90
Wallace, W. David AB '90
Avrin, Bill PhD '91
Douglas, Trevor PhD '91
Drinkwater, III, Donald PhD '91
Gschwend, Daniel AB '91
Kim, Elaine AB '91
Magnano, Anthony AB '91
Mantus, Ellen PhD '91
Williams, Anastasia AB '91
Zhang, Mei-yi PhD '91
Chen, Susan AB '92
Choi, Eugene AB '92
Fura, Aberra PhD, '92
Hoyt, Scott AB '92
Kumar, Uday PhD '92
Langone, Anthony AB '92
Liu, Henry AB '92
Parry, John AB '92
Siefert, Thomas AB '92
Tassie, James AB '92
Tennenhouse, Laura MS '92
Arana, Claudia Ph ' 93
Chung, Connie AB '93
De Leon, Christine MS '93
Elder, Scott PhD '93
Hudson, James MS '93
Miller, Mary AB '93
Nan, Guijuan PhD '93
Ou, Henry AB '93
Schaller, Chris PhD '93
Schraudenbach, Cooper AB '93
Serrao, Victor AB '93
Huang, Richard AB '94
Liu, Zhi PhD '94
Romesberg, Floyd PhD '94
Schipor, Ioana MS '94
Senko, Michael PhD '94
Soriano, Perry AB '94
Wang, Qing PhD '94
Wilson, Jeffrey PhD '94
Alcott, Sasha AB '95
Chan, Anita PhD '95
Glisan, Angela PhD '95
Goering, Bradley PhD '95
Gonzales, Miguel AB '95
Krochmal, Michael AB '95
Rosado, Rosana AB '95
Houry, Walid PhD '96
Kelly, Marie PhD '96
Kim, Peter , "AB '96
Lin, Yung-Kai AB '96
Morales, Juan, MA '96
Pilloff, Daniel AB '96
Rabow, Alfred PhD '96
Sauer, Wendy MS '96
Schvaneveldt, Stephen PhD '96
Willis, Peter MS, '96
Zhou, Jian (Peter) PhD '96
Bernard, Eugene PhD '97
Ponasik, James PhD '97

# News from Alumni and Friends

**John Weikart,** BChem '41, sends us news of another alum, **David Golden,** AB '56. David has received the University of Minnesota's highest alumni honor, the Outstanding Achievement Award, which recognizes exceptional personal achievement in a professional field. Golden is now a senior staff scientist at the Molecular Physics Laboratory of SRI International in Menlo Park, California.

Professor Miller chats with Howard Abel, AB '58.

**John D. Alden,** AB '43 made book news recently. Alden has authored a book, *Salvage Man—Edward Ellsberg and the U.S. Navy*, published through Naval Institute Press.

**Mark Erion,** PhD '85 is now vice president for research at Metabasis Therapeutics (a majority-owned subsidiary of Gensia Sicor, Inc.).

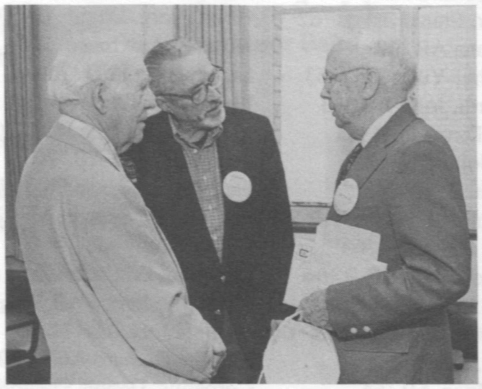
**Angelica Stacy,** PhD '81, professor at the Department of Chemistry, University of California at Berkeley, has been awarded the 1998 Norris Award for Outstanding Achievement in the teaching of chemistry.

**Zafra Lerman,** postdoctoral associate from 1969 to 1973, has been awarded the 1998 ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences and the 1998 Kilby Award. The ACS award is sponsored by the Camille and Henry Dreyfus Foundation. The Kilby award pays tribute to men and women who make extraordinary contributions to society in science, technology, innovation, invention, and education, Lerman is professor of science and public policy and head of the Institute for Science Education & Science Communication at Columbia College, Chicago.

Mary Schuster Jaffee, AB '37

## Reunion 1998

On Friday, June 6, 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. We hope to see you next year!



Walter McCrone, PhD '42; Earl Peters, executive director; and Jerry Pasto '38

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