

Badger chemist : the newsletter of the University of Wisconsin-Madison Chemistry Department. No. 36 1992

University of Wisconsin--Madison. ; Dept. of Chemistry
Madison, Wisconsin: Dept. of Chemistry, University of Wisconsin,
1992

<https://digital.library.wisc.edu/1711.dl/66YCJIVSAA6SF8S>

<http://rightsstatements.org/vocab/InC/1.0/>

For information on re-use, see

<http://digital.library.wisc.edu/1711.dl/Copyright>

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.

Badger Chemist



THE NEWSLETTER OF
THE UNIVERSITY OF WISCONSIN-MADISON

CHEMISTRY DEPARTMENT

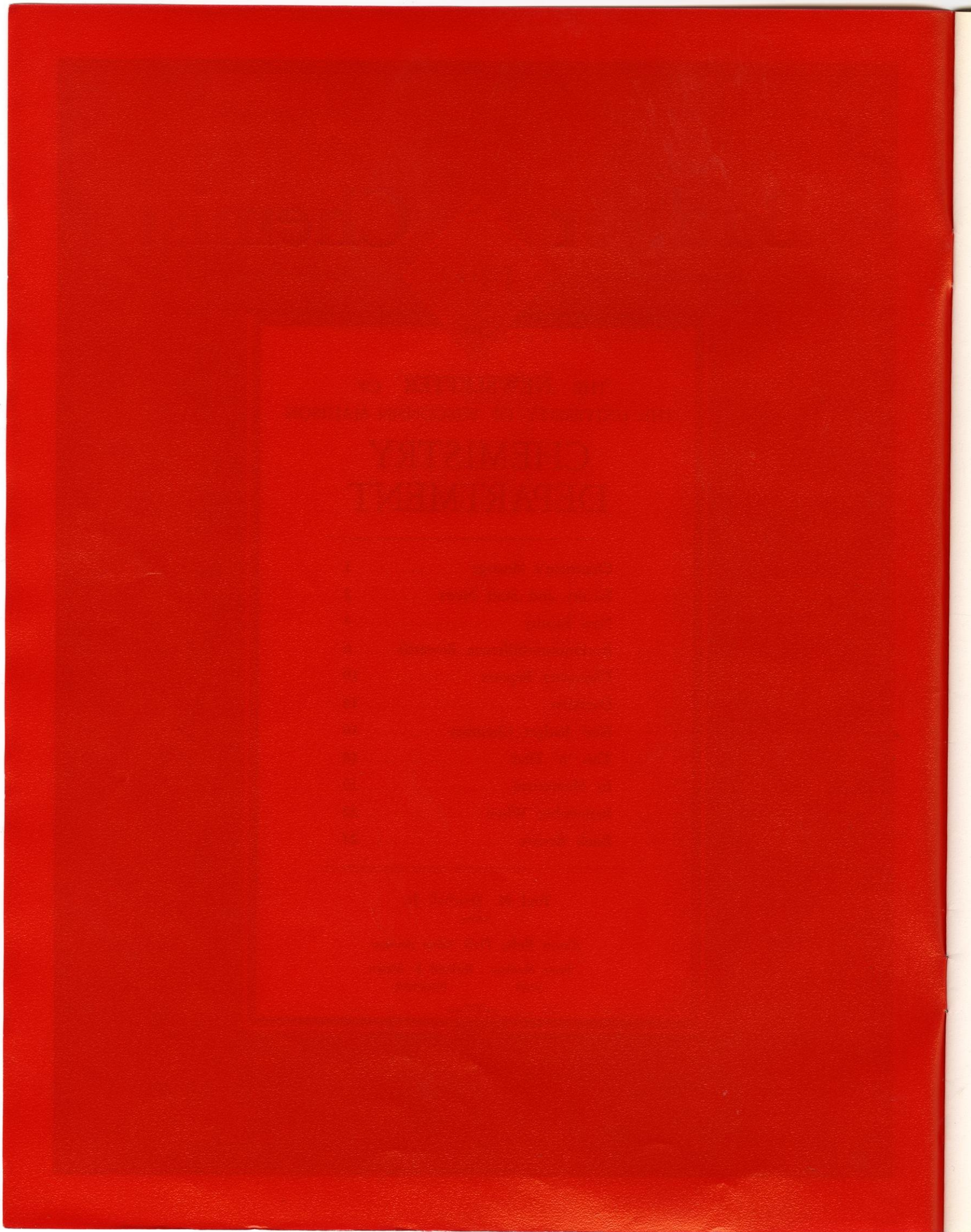
Chairman's Message	1
Faculty and Staff News	2
New Faculty	3
Buckminsterfullerene Research ...	6
Chemistry Reports	10
Overview	14
New Badger Chemists	16
This 'n' That	18
In Memoriam	19
Remember When	22
Book Review	24

Paul M. Treichel, Jr.
Editor

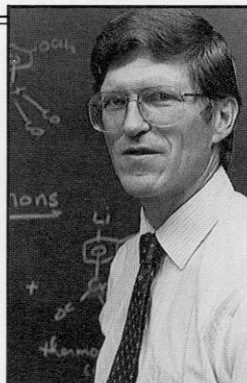
Aaron Ihde, PhD—*Editor Emeritus*

Peter Manesis Richard J. Brown
Design *Typography*





FROM THE CHAIRMAN



1991 — A Challenging Year

THIS HAS BEEN a challenging year for the University. Just as last year's *Badger Chemist* was completed, the State imposed a freeze on hiring and travel. To be allowed to lift the blanket restrictions, the University went through its biennial budget deliberations in spring and early summer. This produced notable shortfalls in the university's budget and 1.27% salary increases for a faculty that was already near the bottom of its peer group in salaries.

Though faced with these concerns, the department is extraordinarily upbeat, for good reason, because there is much more good news than bad. We have seen the addition of a new faculty member and several academic staff members during 1991. There were national and local awards to our faculty and students. Grant and gift funds to the department rose by over 10%, and two major instrument proposals were funded. There was an outstanding entering graduate class and the number of undergraduates studying chemistry has increased. There was continued growth in the stature of our research program due to activities of both younger faculty and senior members of the department. Our reputation for excellence in teaching is very positive and we have the strongest chemical education program in the country.

Perhaps the most important development of the year is that the state budget provided \$1.4M in planning funds for the new building project. There is a high probability for the start of construction in less than two years, with occupancy in four.

If there is a downside, it is that our graduates are having considerable difficulty in the current job market. Most companies that interviewed here in fall were unable to project hiring at the same level as last year, and as the middle of winter approaches, few students have been invited to interview trips. One hopes for an upturn soon. In the meantime, plans are being revised. Some students are seeking postdoctoral appointments, others are delaying completion of their degree.

With plans and guidance of its Long Range Planning Committee, the Department continues to follow its game plan. The major push in faculty hiring during the last five years is over, having established a base for the department and defined a breadth of activities. Our attention now focuses on departmental infrastructure — instruments and equipment, supplies, and facilities, highlighted by the planning of the new building. Of course, continuing to develop additional funding of both the department and individual research groups is a key to this process and must be seen as the overall priority.

A positive attitude of the whole department, buoyed by the successes in the past, make it hard not to be optimistic about the future. We move forward with confidence into 1992.

Paul Treichel



CURRENT NEWS CHEMISTRY

New Faculty

LAURA KIESSLING, a new assistant professor with bioorganic chemistry interests, arrived toward the end of summer and took up residence in the former O'Leary labs. She had already begun to build a research group, having signed up two students from the class entering fall, 1990. She quickly added five more early in the fall, totally filling her current space.

In addition, two faculty promotions went through quickly.

Rob Corn was promoted to Associate Professor with tenure. The recommendation on his promotion received unanimous and enthusiastic approval of the Department and the Physical Science Division. Rob's research is in the area of electrochemistry with a specific interest in electrode surface structure; his teaching involved undergraduate analytical courses and a graduate course in his area of research.

Jim Weisshaar was promoted to full Professor. Jim's research is in chemical physics, probing the influence of electronic structure on chemical reactivity of gas phase transition metal atoms and ions. His research program has grown rapidly since promotion to tenure in 1987, and during the last year, he was involved in setting up a second laboratory in the room that previously housed the the TCI library—this being done with major new funding from NSF. Jim is also an important force in the teaching program, providing the leadership for development of a new high level course, Chemistry 115-116, for chemistry majors.

At the beginning of the spring semester, **Tom Record's** faculty appointment changed to an equal split between Chemistry and Biochemistry. Tom has been more heavily involved in the Biochemistry Department in recent years, reflecting his evolving research interests. He had held a *zero percent time* appointment in Biochemistry for a number of years previously that allowed him to

supervise Biochemistry students, sit on committees, and contribute to teaching in that department. He sought a larger formal association and Biochemistry agreed. There ensued a lengthy and complicated negotiation, lasting much of the spring semester and involving two chairmen, two deans, (Chemistry is in L & S while Biochemistry is in CALS, the College of Agriculture and Life Sciences), and on several occasions intervention of Vice Chancellor Ward. But, eventually the details were worked out, and then the arrangement was made retroactive to the beginning of the semester.

In September, Tom moved a large portion of his experimental program to large, newly refurbished labs in Biochemistry. He still retains his office in the Mathews Chemistry building wing, along with some additional space for experimental work and for his theoretical program. He will continue to teach Chemistry 565, the Physical Chemistry course he developed for students with biochemical interests, and his graduate course, Chemistry 869, The Chemistry of Proteins and Nucleic Acids.

Finally, we note that Assistant Professor **William Pietro** resigned his position in March, 1991; he is now at York University in Toronto.

Academic Staff

THE position as Director of Mass Spectrometry was filled by **Dr. Cornelis (Marcel) Hop** (See article, page 4). This position had been vacant for about 1.5 years; **Dr. Johnnie Brown** was the previous director. This is one of three such positions in the second floor Chemistry Instrument Center, 'CIC', the other positions being in the NMR and x-ray crystallography areas, filled by **Dr. Dick Fronko** and **Dr. Doug Powell**. This strong group of young scientists in CIC

has been working aggressively to build this facility. During the last year, Doug Powell and Dick Fronko have been the force behind two NSF funded instrument proposals. The department is in the process of acquiring an area detector and upgrading its x-ray diffraction equipment and associated computers. We also expect to receive delivery on a new ESR spectrometer within the next several weeks.

Marcel is currently in the process of setting up a high resolution spectrometer given to the department by the Amoco Research Center. He has also prepared a proposal to NSF for a new spectrometer.

A second position in the CIC became vacant with the recent death of **Ted DiFiore** (see obits, page 19). Roger Clausen, who had previously been employed in the Electronics Shop, was chosen to fill this position in July. This promotion involved an interesting change of classification. Roger, an Electronics Technician in his previous position, had been a member of the classified staff (civil service) and his new position is within the category known as Academic Staff, an 'Unclassified Staff' category (faculty also hold unclassified appointments). The distinction in job classifications is sometimes hard to define but, in general, Academic Staff persons have more flexibility in their job descriptions and activities, and a greater possibility for growth and independent activity.

Steve Gammon, General Chemistry Laboratory Director for the past two years, took a faculty position at the University of Idaho. We were sorry to lose Steve, but this was also expected and planned. Steve came to Wisconsin to be a SERAPHIM Fellow in 1988, but we convinced him to be the Laboratory Director instead, knowing that he would move on in due time. The close friendships and professional activities involving Steve and the Madison faculty will certainly lead to continued interactions in the future.

The new General Chemistry Laboratory Director is **Dr. Lynn Hunsberger**. Lynn

is a graduate of the University of Illinois, and received her graduate degree in this Department (Ph.D. '91, Ellis). She had been working as an ICE Fellow for several months before starting in this new position. As with Steve Gammon, Lynn has a goal of gaining a faculty position in a few years.

Visiting Faculty

MANFRED BRAUN, Professor of Organic Chemistry at the University of Dusseldorf, was a visitor during fall, 1991 and taught Chemistry 343, the first semester of organic chemistry.

Tim Clark returned to Madison after a four year absence. Tim, on leave from his faculty position at the University of Erlangen, Germany, had previously been here in 1987. He served as a Visiting Associate Professor during the spring semester and taught Chemistry 343.

Robert Fitch came out of retirement to teach Chemistry 664, Macromolecular Chemistry, during the spring semester, 1991-2.

Dr. Fitch had retired from the post of Senior Vice President of Research and Development and Chief Scientific Officer at S. C. Johnson and Son in 1989. Earlier in his scientific career was a twenty year stint (1962-1982) on the faculty at the University of Connecticut. Currently, he has a continuing involvement with education, as Chair of the National Industry Council for Science Education.

Suzanne Harris (Ph.D. '72, Fenske) spent the spring semester, 1990-1 on the Madison Campus as a Visiting Associate Professor. She taught Chemistry 711, the popular course in theoretical inorganic chemistry taught by her Ph.D. mentor for many years. Suzanne then began a new career, as a faculty member at the University of Wyoming. Previously, she had worked at Exxon.

Other teaching assignments in the department: **Barbara Whitlock** served as Organic Chemistry Lab Director for the full year, 1990-1, while **Paul Schatz** lectured in Chemistry 343 in fall, 1990, and worked with **John Moore** on Project SERAPHIM during both academic semesters. **Tony Jacob** (Ph.D. '91, Ellis) taught Chemistry 108 in the spring semester and also worked with ICE; **Melissa Donaghue** (Ph.D. '92, Ellis) taught the same course in fall, 1991-2,

(cont. pg. 4)

About our new Faculty...



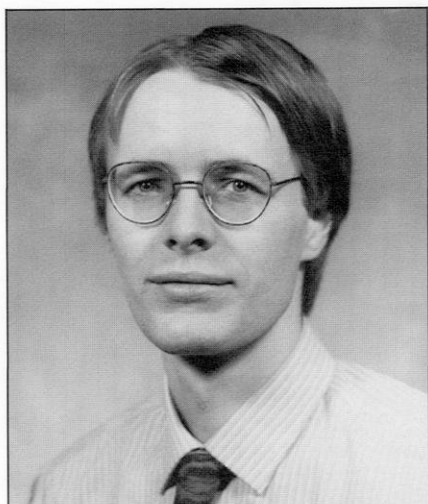
LAURA KIESSLING ▲ has recently joined the faculty as an Assistant Professor in Organic Chemistry. She earned her doctorate with Stuart Schreiber at Yale in 1989, where she studied the potent antitumor agent calicheamicin.

In addition to working on this natural product, Laura contributed to the development of a model for the interaction of this substance with DNA. After completing her graduate studies, Laura continued to pursue an interest in the chemistry of biological molecules with postdoctoral training in the laboratory of Peter Dervan. As an American Cancer Society Postdoctoral Fellow at Caltech, she developed non-natural bases for the chemical recognition of duplex DNA through triple helix formation. This work involved design of new molecules, synthesis of the desired compounds, and evaluation of the DNA-binding properties of these substances. One of the molecules that Laura developed is now being employed in efforts directed at localizing a genetic disease on a human chromosome.

From this background, Laura has developed research interests that lie at the interface of biology and chemistry. One interesting problem involves a study of carbohydrate-protein interactions that underly intercellular recognition. This effort will focus on oligosaccharide ligands that have been implicated in cell adhesion processes that are crucial to immune

system function. Laura is utilizing synthetic organic chemistry to prepare natural and non-natural oligosaccharides that can be used to uncover the origins of binding specificity. In addition to providing information about how white blood cells are targeted to locations within the body, it is anticipated that these experiments may identify anti-adhesive molecules that will find medical use in the treatment of inflammatory diseases and reperfusion injury. Because cancer cells often have the same surface carbohydrates, adhesion inhibitors may also find use as antimetastatic agents in cancer therapy. In addition to these studies, Laura is pursuing methodology to allow the preparation of large RNA molecules with modified bases in any desired location. This will provide a means to investigate RNA interactions with other biological macromolecules as well as functional questions related to catalysis. Of particular interest are RNA-protein interactions that regulate gene expression such as those found in retroviruses.

Laura's arrival at Wisconsin has been a homecoming for her as she was born in Milwaukee and grew up in Lake Mills. She spent her first year as an undergraduate at UW-Madison and became interested in chemistry working in the laboratory of Art Ellis. She then moved on to M.I.T. where she received her S.B. in 1983. ●



DR. HOP TO DIRECT MASS SPECTROMETRY LABORATORY

In September, 1991, Dr. Cornelis Hop filled the vacant position of Director of the mass spectrometry laboratory in the Chemistry Instrument Center. Born and raised in The Netherlands, he received his M.Sc. degree from the University of Utrecht. Two days later he went to Ottawa, Canada, and joined the mass spectrometry group of Prof. J.L. Holmes, where he extended the use of mass spectrometry to the study of transient neutral species. In the framework of a longstanding cooperation between the Universities of Utrecht and Ottawa, he received his Ph.D. degree at the former university in 1988. His most recent position was as a postdoctoral research associate at the University of Waterloo, Canada, where he worked with Fourier-transform mass spectrometers.

His goal here is to replace all our present equipment within three years and create a center which can handle routine analysis as well as state-of-the-art mass spectrometric experiments. The first piece of equipment, a high resolution mass spectrometer donated by the AMOCO Research Center, Naperville, IL, arrived in November, 1991. After completion of this replacement program, the mass spectrometry laboratory is ready to enter the next millennium.



while finishing up her degree work.

ICE and SERAPHIM brought a number of scholars to the department at various times during 1991 including: Professors **Jack Kotz** (SUNY-Oneonta), well known as a coauthor of top rated texts in inorganic and general chemistry; Professor **Ludwig Mayer** (San Jose State U.) who worked with Art Ellis and ICE to develop a low cost model kit demonstrating crystal structures (article, page 10); **Robert Rittenhouse** (formerly of Eastern Michigan U. and now at Walla Walla College); **Frank Darrow** (Ithaca College); **Paul Rasmussen** (U. of Michigan); **Richard York** (Wittenberg U.); **Tadayosi Yoshimura** (Fukui, Japan, National College of Technology); and **Gary Trammell** (Sangamon State U.). Also here over the summer were high school teachers **Michael Morgan** (Francisco Bravo HS, Los Angeles), **Robert Shaner** (Hookstown, PA HS), and **Br. Michael Liebl** (Mt. Michael Benedictine HS, Elkhorn, NE).

Other News from the Faculty

PHIL CERTIAN (Ph.D. '69, Hirschfelder) was named Associate Dean of the College of Letters and Sciences. His appointment, which began Aug., 1991, is formally a half-time assignment; Phil has responsibility for the Physical Sciences.

Chuck Casey was a plenary lecturer at the XVth senior technical meeting of the Puerto Rico Section of the ACS, in Ponce, PR in Nov., 1991. There he made contact with two Wisconsin Ph.D.s now holding faculty positions in Puerto Rico, **Emilio Diaz** (Ph.D. '86, O'Leary) and **Rafael Arce** (Ph.D. '69, Willard). The Casey research group hosted the Third DOE-Basic Energy Sciences Research Conference on Organometallic Chemistry and Homogeneous Catalysis in Madison in June, 1991. Madison faculty participants along with Chuck Casey included Professors **Dahl**, **Landis**, and **McMahon**. A number of Badger Chemists presented papers including **William Jones**, U. of Rochester (Postdoc '80, Casey), **Richard Jones**, U. of Iowa (Postdoc '82-3, Casey), **William Evans**, U. of California-Irvine (BS, '69), **Ken Caulton**, Indiana U. (Ph.D. '68, Fenske), **Jim Espenson** Iowa State U. (Ph.D. '62, Alberty), and

Mark Andrews, Brookhaven National Labs (Postdoc '79, Casey).

Art Ellis has completed his first year Chair of the Material Sciences Program. He was appointed to the IUPAC Committee on Advanced Materials. He was a co PI, with **Phil Certain**, on a funded Department of Education National Needs grant providing fellowship support to Chemistry and Materials Science students, and lead PI on an NSF funded project to create instructional materials for a materials based general chemistry course.

John Ferry wrote a historical review on the development of polymer dynamics from 1930 to 1970. John has also contributed recollections from his early years in a BC feature (see page 23).

Sam Gellman was an invited lecturer at the Peptide-Protein Bridge meeting at Toronto, June, 1991.

New arrivals

BOB and **JEANE HAMERS'** first child, **Laurel**, was born on Nov. 4. **Lloyd** and **Judy Smith** also have a new daughter, **Layne Elizabeth**, their second child, born Aug. 5, 1991. **Duncan Skinner**, **Jim** and **Wendy's** second son, arrived September 15.



Aaron Ihde spent half of August in Switzerland, with son John and daughter Gretchen and their families, at the occasion of his granddaughter Jennifer's wedding. Aaron attended the national meeting of the History of Science which was held at Madison last fall in recognition of a half century of the History of Science Department at the UW-Madison. Ten former History of Science students and postdocs were present at the meeting.

John Moore presented two award addresses—in Atlanta at the spring ACS meeting (Chemical Education: Opportunities and Responsibilities) for the ACS Pimentel Award, and at Boston College (*From What We See to What We Do Not See: The Teaching-Learning Process*) for the James Flack Norris Award. He also traveled to Hamilton, Canada to address the Canadian Institute of Chemists meeting and to Helsinki, Finland, to speak at the Finnish Chemical Congress.

Hans Reich gave a plenary lecture at the Sixth International Conference on

Selenium and Tellurium in Osaka, Japan, July, 1991.

Ned Sibert and **Gil Nathanson** visited the Institute for Molecular Science in Okazaki, Japan as members of the first U.S.-Japan Workshop for Young Scientists. The workshop, designed to introduce young American and Japanese scientists and foster joint research efforts, included five days of seminars and discussions on theoretical and experimental chemistry.

Lloyd Smith was appointed to the Department of Energy's Human Genome Coordinating Committee, which advises the DOE Human Genome Program on goals, progress and strategies. Travel figured prominently in his activities, with 16 talks given at US locations this year. He has filed three patents from Wisconsin. One patent, for Direct Cloning of PCR Amplified Nucleic Acids, was assigned to Chimex, a Madison firm started by former colleague **David Mead**; a second describing a horizontal thin gel electrophoresis apparatus, was assigned to another new company, Fotodyne, located in New Berlin, WI. This patent, and also a third patent from his group for a device for detection in DNA electrophoresis gels, are being handled by WARF.

Jim Weisshaar was promoted to full professor. He gave an invited lecture at the European Science Foundation's Symposium on High Resolution Photoelectron Spectroscopy in October, 1991, at Kreuth, Germany. He is now occupying his newly remodeled laboratory, constructed to house his second molecular beam apparatus and is anticipating the first results from this lab in spring, 1992.

Bob West visited Russia in August 1991 as a guest of the Soviet Academy of Sciences, lecturing and discussing collaborative research programs in Moscow and Leningrad. He left Russia just as the coup was beginning. Other travel included a week in Germany in September to take part in the Wacker Silicone Prize ceremonies, and in Hawaii in December to take part in a meeting on silicone based polymers. Bob does much traveling around the US, usually flying himself in a single engine Cessna airplane. In July he made his first light plane trip to the west coast, Oregon, and back.

Bob's research group is more international than ever, now including people from seven different countries besides the

U.S. Among the new kinds of molecules recently discovered are allylically stabilized silyl anions and stable 1-silaallenes. In research on polysilane polymers (containing only silicon atoms in the backbone) the group has found liquid crystal properties for many homopolymers and copolymers. Recently, the group has begun research on **buckminsterfullerene** chemistry; this work is featured in the article on page 6.

Old members of **John Wright's** group may feel even older when they find out that the youngest of John's kids has left the nest for college. **David** enrolled at Carleton College in Northfield, MN, across the river from his sister **Dawna** who is at St. Olaf College.

News from the Wright group

ANDRIES MEIJERINK, visiting faculty member on leave from the University of Utrecht, has recently returned home. He came to learn laser techniques for following the dynamics of defects in solids but succeeded in discovering the key mechanisms that control the dynamics of superionic conductivity in fluorites. In particular, he found Schottky defects in fluorites. The group is also excited about the recent discovery by current graduate student **Peter Chen** that the fully resonant four wave mixing methods that the group pioneered over the years can be extended to infrared spectroscopy. Since infrared spectroscopy involves inherently sharp lines and is universally applicable, this advance allows the site selective spectroscopy methods of the past to be extended to a wide range of applications. John says this will be big news in the future.

Hyuk Yu had a full schedule of US and international travel in 1991. The latter included trips to Korea (Korean Polymer Symposium), to Japan twice, to China (International Chemistry Congress), Greece (27th Europhysics Conference on Macromolecular Physics), Germany, and France (Strasbourg Symposium honoring Henri Benoit).

Howard Zimmerman gave an Arthur C. Cope award lecture at the New York ACS meeting and an invited lecture at the InterAmerican Photochemical Society winter conference in Clearwater, FL.

A long way from home

An exchange program with Moscow State University brought Professor **Alexei Dedov** to Madison.

During 1990, we enjoyed the company of Dr. **Alexei G. Dedov**, a leading researcher at Moscow State University. He came to Madison first in the



Prof. Dedov

spring of 1990 for a six week visit as part of an exchange program between MSU and UW. The exchange program was established by the History Departments of the two schools, but has since been expanded to include other disciplines. During his first visit, Dr. Dedov gave a fine seminar on his research, the study of polymer supported catalysts for the hydroxylation and hydroxysilation of alkenes.

In August of 1990, he returned as the leader of the Soviet contingent to UW, this time bringing his wife **Olga** and charming 9 year-old daughter, **Katia**. The Dedov's were in residence for the entire fall semester. **Alexei** worked with **Chuck Casey's** group, and **Olga**, a Ph.D. in linguistics, with the Slavic languages department. This time around, **Alexei** presented a seminar comparing and contrasting our educational system with that of the Soviets. The seminar included several wowsers, including the revelation that the governing council of the department of chemistry employs some 3000 faculty and staff and 1500 students (including graduate students).

As the Dedov's were preparing to leave in January, a student in the Casey group, **Gerry Nicolai**, thought that some gesture of thanks was in order. Given the rather grim situation prevailing in the Soviet Union at that time, it was decided to send some food to his department. Through the generous contributions of many grad students, faculty and staff, and with the political support of Senator **Kohl**, 100 pounds of fine Wisconsin sausage accompanied **Alexei** to Moscow, bringing some cheer to our Russian colleagues in an otherwise bleak winter.

The exchange program continues. This year, the faculty advisor to the undergraduates participating in the exchange is Dr. **Alexandr Nemukhin**, a theoretical chemist working with **Frank Weinhold**.



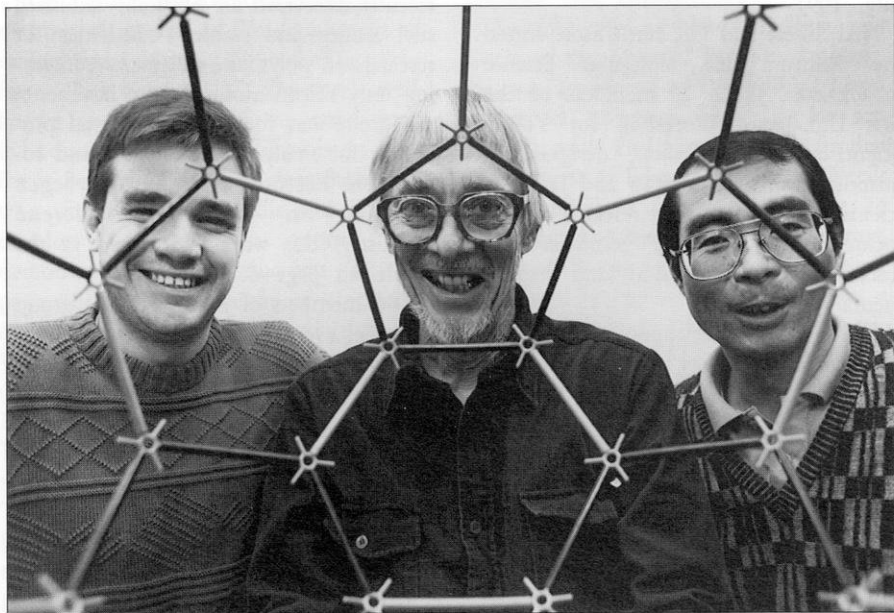
Bucky Balls

The possibility of C_{60} was first predicted by Eiji Osawa while he was a post-doc with Bob West.

Prof. Osawa has recently accepted a position at the Toyohashi Institute of Technology and Science in Toyohashi, Japan.

NOW that C_{60} has been featured in stories in the *New York Times* and in a spread in *Newsweek*, even the general public has heard of the new form of carbon, nicknamed *buckminsterfullerene*. Molecules of C_{60} have the icosahedral symmetry of a soccer ball. The name, of course, honors the late architect and visionary, Buckminster Fuller, since the molecule's shape is also similar to Fuller's "geodesic domes". There is an early Wisconsin connection with C_{60} . The first person ever to suggest this unusual molecular structure was Dr. Eiji Osawa, a postdoctoral fellow in Prof. West's group in the late 1960's. Osawa returned to Japan and embarked on a career in theoretical organic chemistry, in 1970 publishing his forward-looking prediction of the C_{60} structure.

Cut now to 1990. Fullerenes, C_{60} , C_{70} and others, are now a reality, forming a new, third crystalline form of carbon besides the well-known diamond and graphite. They can be made in modest quantities by vaporization of carbon,



Wisconsin's bucky ball team, with the apparatus used for the synthesis of C_{60} , "buckminsterfullerene." Prof. Bob West, postdoc Kunio Oka and graduate student Michael Miller.

most easily by striking a carbon arc in an inert atmosphere. Early in 1991, chemist at DuPont Central Research isolated a platinum complex of C_{60} , $C_{60}Pt(PPh_3)_2$, and showed that this substance has a structure like that of a typical platinum-olefin complex. This finding caught the interest of Bob West and his group, since platinum olefin complexes are thought to be intermediates in the platinum-catalyzed addition of H-Si bonds to olefins ("hydrosilylation"). It therefore seemed possible that C_{60} could be hydrosilylated.

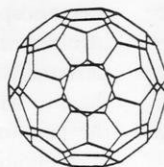
Initial experiments at Wisconsin were done on a 3mg scale. In the presence of a trace of platinum, C_{60} , reacts rapidly with phenylsilane, $PhSiH_3$, yielding molecules containing several silyl groups, $H_nC_{60}(SiPhH_2)_n$. These form a brown solution in hydrocarbons. Exposure to air knitted the silylated bucky balls into an insoluble crosslinked polymer.

Bob and his students believe the polymer has a structure in which the bucky balls are joined by siloxane links, $\dots C_{60}-Si-O-Si-C_{60} \dots$, like pearls on a chain. The siloxane bonds are apparently formed by air oxidation of the Si-H groups. Because more than two silicon

atoms are present on some of the silylated C_{60} molecules, the polymer becomes crosslinked. One of the next goals will be to synthesize a soluble, linear polymer. But hydrosilylation of fullerenes offers many other possibilities. For instance, it may be possible to coat surfaces with siliconized C_{60} , to form a "forest" of C_{60} "trees", each attached to the surface with Si-O bonds.

First, however, the fullerenes themselves are needed. The Wisconsin bucky ball team is working partly with purchased carbon soot, and partly with soot made in the home-built reactor shown in the photo. In the reaction, an arc is struck between a sharpened carbon rod and a carbon block. As the rod is vaporized, it slides downward under the force of gravity, being vaporized in about 10 minutes. The soot is then washed out of the reactor and extracted with toluene, to dissolve the fullerenes. Separation is achieved by column chromatography, producing a royal-purple solution of C_{60} , followed by a wine-red solution of C_{70} .

On November 2, the reactor's first operation produced Wisconsin's initial crop of fullerenes. Bob West says "As the home of *Bucky Badger*, the University should certainly have its own *Bucky Balls*." •



Professor Ben Widom: First Hirschfelder Lecturer

ON October 15 and 16, Benjamin Widom, Goldwin Smith Professor of Chemistry at Cornell University, delivered the first Hirschfelder Lectures in Theoretical Chemistry. Professor Widom is a theoretical chemist of international stature who has played a central role in the development of modern statistical mechanics. He is particularly well-known for his seminal theories of scaling near an equilibrium critical point, three-phase equilibrium and tricritical points, surface and interfacial tension and structure, and phase diagrams of surfactant solutions. He has been the recipient of several national awards including the American Chemical Society's Langmuir Award, and more recently, the 1991 Hildebrand Award. He is a member of the National Academy of Sciences.

The titles of Professor Widom's talks were "The Line-Tension Story" and "The Repton (Rubenstein-Duke) Model of Electrophoresis". The first talk involved a discussion of the line



interface separating three distinct phases as the wetting transition is approached. The second talk concerned a lattice model of polymer repetition, with particular emphasis on understanding how the diffusion constant scales with polymer size. Judging by the tremendous audience turnout, the crystal-clear and exciting deliveries, and the ensuing spirited discussion, the lectures were a tremendous success. Professor Widom's two day visit also included meetings with many faculty members and a reception to which theoretical students and faculty were invited.



The annual Joseph O. Hirschfelder Lectureship in Theoretical Chemistry was established this year by the Theoretical Chemistry Institute, and made possible by a generous gift from Professor Hirschfelder (1911-1990) who had a distinguished career of over 40 years of teaching, research and public service at the UW.

Rating University R&D

Every year university officials, as well as local governments and higher education associations, eagerly await the National Science Foundation's (NSF) annual rankings of R&D expenditures at the country's 100 biggest research universities. But researchers at the University of Arizona's Center for Higher Education are trying to put the annual rite in perspective. It's a one-dimensional measure of a multidimensional situation, they argue. "Although R&D expenditure measures institutional ability to raise research money, it does not assess research activity in any

broad sense," say Randall H. Groth, Kenneth G. Brown, and Larry L. Leslie in a paper now seeking a publisher.

The three researchers aren't just speaking off the cuff. They have spent the past 5 years refining an alternative system, called a Research Activity Index (RAI). The RAI derives a single score for each institution from 11 weighted variables. These include total Ph.D.'s awarded; R & D expenditures from federal, local government, industrial, and institutional sources; equipment expenditures; numbers of graduate and postdoctoral students in science and engineering; and an index of library size.

The results produce a ranking that sometimes varies quite a bit from that produced by the NSF. Harvard, for example, was in 5th place in the NSF's scheme in 1987 (the latest year for which the analysis has been performed), but only 14th according to the RAI — reflecting the fact that Harvard gets relatively less money than the average university from nonfederal sources. Texas A&M, in contrast is ranked 7th — as opposed to 14th by the NSF. Center director Leslie says factors such as the addition of graduate students or more equipment expenditures could jack up ratings.

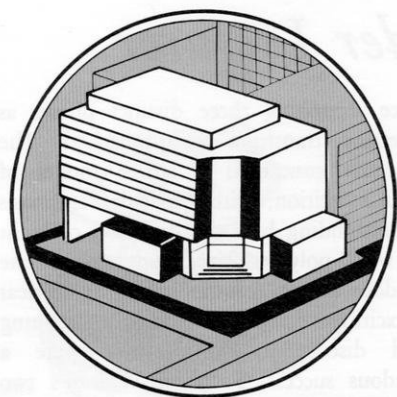
From *Science*, Vol. 253, Number 5027, page 1485 (1991). We thank the AAAS for permission to reproduce this article.

University R&D activity, 1987*

Two Alternative Rankings for Top 10 Institutions

NSF	U. of Arizona's RAI
1. U. Wisconsin-Madison	1. MIT
2. Cornell University	2. U. Wisconsin-Madison
3. Stanford University	3. Cornell University
4. U. California-Berkeley	4. Stanford University
5. Harvard University	5. U. Michigan
6. MIT	6. U. Minnesota
7. U. Illinois-Urbana	7. Texas A&M University
8. U. Minnesota	8. U. California-Los Angeles
9. U. Michigan	9. U. Illinois-Urbana
10. U. California-Los Angeles	10. U. Washington

* This was the latest year for which figures are available when the analysis was performed; the RAI is now being updated.



BUILDING ADDITION UPDATE

**
*

CHRIS GLUESING from the UW Office of Planning and Construction and I attended the State Building Commission meeting on the afternoon of November 20, in the event that we would be called on to answer questions about the Chemistry Building plans. The motion on item 10 was read aloud:

UW-Madison—Request authority to release \$1,400,000 Graduate School Revolving Funds and authority to prepare preliminary plans and a design report for the Chemistry Building Addition at an estimated project cost of \$21,451,000 and a Chemistry Building Remodeling project at an estimated cost of \$9,942,000 under the WISTAR Program.

Senator Fred Risser was in the Chair, sitting in for Governor Thompson who had been called from the room moments earlier. With no discussion, the Committee gave its unanimous approval by voice vote; and in 30 seconds, the new Chemistry facility had moved one large step closer to reality.

How did we reach this point? The last BADGER CHEMIST, (BC 35), anticipated the Regent approval of the chemistry project, and this happened as expected. Chancellor Shalala's bold proposal for a speeded up building proposal for the Madison Campus, labeled FAST (Facilities Advancement for State Technology), was taken over by Governor Thompson; it was expanded to include other key research facilities in the state and relabeled WISTAR (Wisconsin Initiative for

State Technology and Applied Research). The plan received approval of the State Building Commission in April, Legislative approval in July, and the Governor's signature in August. The Building Commission's approval of funds was then the next step needed to proceed with this project. Building Commission approval now allows the university to hire an architect and consultant and to proceed most of the way to develop a set of working plans.

Further in explanation of the motion: the Graduate School is actually *loaning* the money, from its revolving fund, to start preparing plans. When funding for the building itself is approved (by similar legislative and Building Commission action) the money will be restored to the Graduate School.

WISTAR's plan identifies \$150M in new construction and \$75 million in renovation to be carried out on the Madison campus over the next 8 years. Funding for new construction will be split evenly between state and non-state sources, meaning that \$7.5 million of non-state funds (gifts, federal funds) must be generated for these projects. Items two and four on the WISTAR new construction list are the two parts of the Chemistry project so both of Chemistry's projects, new construction and remodeling, require matching funds. The University is counting on finding \$16 million for the chemistry project.

Two new committees were set up at the start of the fall semester.

The Department's *Building* Committee has begun an in-depth review and assessment of the plans that we had submitted in conjunction with our building proposal. The goal of this committee is to provide a plan to the architects that best meets our needs, a plan containing as much detail as possible. Although the plan submitted (and approved) was already quite detailed, about the only things that are really firm are the cost (\$32M), the amount of new space (approx. 53,000 ASF), and the site (west of the Mathews Building, on the Johnson St.-Charter St. corner). At this moment, we are looking seriously at the division of space between synthetic and instrumental labs, offices, conference rooms, and classrooms and the eventual placement of these functions within the building. The difficulty of this exercise is compounded since we are trying to an-

ticipate needs four to six years from now. Future deliberations will focus on design of new labs. If we come up short on funding, then we will also have to assess the costs versus the benefits of proposed types of remodeling.

Fund raising represents a major challenge. The UW Foundation has appointed Donald Gray to head up fundraising for the whole WISTAR operation. A departmental Funding Committee is charged with assisting Mr. Gray. The amount of money is about two to three orders of magnitude higher than we usually think about; the obvious sources are federal grants and gifts from individuals and foundations.

Remodeling



Even as we look ahead to major changes we are being called on to remodel the building to accommodate existing programs. For example, two doors in the second floor instrument center were replaced

with double doors so that we could bring in the new ESR and mass spectrometry equipment that was recently acquired.

The need for space with minimal vibrations is increasingly important as instrumentation becomes more sensitive. Bob Hamers' SCM work is about as demanding as any, and his new labs in the sub-basement rated excellent on this criterion.

The plan to remodel several organic synthesis labs, mentioned in BC35, was scaled down because of costs to include only the two West Group labs on the sixth floor. Plans were put on hold when the University had to deal with the anticipated massive increase in air flow. This increase is expected because our remodeling greatly increases the number of hoods. A variety of schemes have been proposed — and no decision has yet been reached how to accommodate chemistry's needs vs the cost and state imposed limitations. We expect resolution soon, and construction in summer.

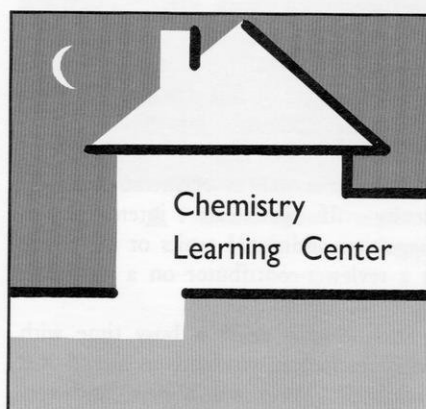
As far as we can determine, hoods in chemistry buildings are a contentious subject at most universities. We will eventually have the situation figured out, and we ought to have an interesting report in next year's issue.

ACS Student Affiliates Chapter Organized

Professor Robert Hamers and Lynn Hunsberger have organized a UW-Madison chapter of the American Chemical Society-Student Affiliates. This organization is a branch of the ACS specifically designed to meet the needs of undergraduates in chemistry and related chemical sciences. At a major research university like UW-Madison, the needs of undergraduates are, unfortunately, often lost among all the other activities of education and research. With the number of students graduating in chemistry and related sciences declining nationwide while the needs of industry for people with scientific and technical backgrounds is increasing, one of the long-range goals of this organization is to help foster an interest in chemistry as a profession. The ACS-SA serves a dual role both as a source of information on chemistry as a professional career and as a social organization for undergraduates to meet and interact with one another in an informal setting.

The ACS-SA chapter has enlisted a number of highly motivated undergraduates, who have helped to publicize the group's formation and get other students involved. The first organizational meeting attracted more than 60 students; the group is now well established with a core group of 20-30 dedicated members who are developing their own ideas for ACS-SA activities and sustaining the group's initial momentum. In order to sponsor professional and social activities, the students have raised money through several very successful fundraisers. These include selling safety goggles for Lab courses, selling the *CRC Handbook of Chemistry and Physics*, and donut selling in the lobby of the chemistry building. Last year the group organized field trips to Hazelton Laboratories and to Forest Products Lab on the UW-Madison campus and sponsored several evening talks related to chemistry careers and graduate studies. This year the group is planning field trips to Argonne National Laboratories and to the Museum of Science and Industry in Chicago, and the National ACS Meeting. The students also plan to sponsor a competition among undergraduates doing undergraduate research,

with the winner being sent to the ACS National Meeting in Chicago. The students are also interacting with high school teachers at LaFollete High School in Madison to sponsor a science fair for interested high school students. The local regular ACS chapter has been supportive of the ACS-SA and has provided financial assistance in the form of a startup gift and temporary loans for activities. Professor Robert Hamers is the ACS-SA faculty advisor; Glenn Kowach is the ACS-SA student president.



Tutorial Program re-named

The Chemistry Tutorial Program for minority-disadvantaged students has a new name. It is now the *Chemistry Learning Center*. The program, under the guidance of Director Cathy Middlecamp, continues to provide a supportive, multicultural environment for minority and/or non-traditional students in general chemistry courses.

It turns out to be far more difficult to change a name than we had expected. The recommendation from the Learning Center Advisory Committee and the Department first needed approval of the Dean of the College, then it was endorsed by the Academic Planning Council (an all-university committee headed by Chancellor Shalala), and finally approval by the the University of Wisconsin System. Responding to the Department (about six months after we started this process), UW System Academic Vice President Beaver indicated that the new name would simply be reported to the University Regents — for unknown reasons their approval was not required.

5 Year funds for Helfaer Chair

On April 8, 1991 the UW Board of Regents approved a proposal from the department that Professors Reich, Vedejz, Wright, and Yu be named Evan P. Helfaer Professors of Chemistry. These awards, modeled after the UW's University Houses Chairs, provide research funding for a five year period.

The history of these awards goes back over two decades. Evan P. Helfaer was a 1920 chemistry graduate of the UW and the founder and president of Lakeside Laboratories in Milwaukee. His numerous activities included serving on the Board of the UW Foundation, receiving the Distinguished Service Award from the Wisconsin Alumni Association.

In 1972, the Helfaer Foundation of Milwaukee presented a major gift to the UW foundation to support UW professorial chairs and scholarships in chemistry and medicine. After unsuccessfully trying to use this chair to attract a senior organic chemist from another university, the department named Professor Barry Trost to the first Evan P. Helfaer Chair in Chemistry in 1976. Professor Trost held this chair through 1985, relinquishing it when he was appointed Vilas Professor. The Department then established the current policies governing the administration of this award. The fund had appreciated in value, so it was decided that more than one award could be made. Awards were to run five years, and provide research funding in an amount similar to that given to other University Chair recipients. The department also suggested that the award's should go to 'outstanding younger faculty members' to provide important research support at a critical time in the recipient's career. This is sometime between the University's Romnes Awards (given to persons within the first four years after receiving tenure) and the University Houses Chairs (usually given to mid-career faculty members). Professors Chuck Casey and Fleming Crim were then named to Helfaer Chairs.

We moved on the reassignment in midyear, forming a committee of current chairholders in chemistry to review the rules and evaluate candidates for the P. Helfaer Professors of Chemistry awards. ●

CHEM REPORTS

*ICE publications
off the presses...*

ChemCamp on the road...

*SPICE Outreach hits
record attendance...*

IT has been a busy year for the general chemistry division, the Institute for Chemical Education, Project SERAPHIM and its new incarnation, CATALYST, and Journal of Chemical Education: Software. Grants were received from the Dow Chemical Company Foundation (to support SPICE), from the UW Graduate School (to present a ChemCamp at Chicago State University), from NSF (for development of computer-mediated general chemistry labs and for production of six videodiscs on chemical reactions, industrial processes, the history of chemistry, and molecular and crystal structures), from the Spectroscopy Society of Pittsburgh (to support teachers in ICE's summer workshops), from the Society for Analytical Chemistry of Pittsburgh (to support SERAPHIM workshops), and from D.C. Heath (to support production of video materials). We have received a further donation of computer equipment from IBM Corporation; a year ago, they had also donated \$750,000 worth of equipment for our general chemistry program. We certainly appreciate all this support and are attempting to use it as effectively as possible to enhance students' learning.

ICE has been able to fulfill its promise of a publications program. The first publication, *ICE Picks: Recommended Books of Science Activities*, came off the press in October 1990, and since then there has been a steady stream of materials designed by teachers, for teachers, at prices that they can afford. We have now released nine publications, including three Topics in Chemistry,

Memory Metal, the Optical Transform Kit, Hands-On Activities (several experiments to be done at home by young children who attend SPICE programs) and a guidebook for over 50 hands-on chemistry activities and demonstrations titled 'Fun with Chemistry'. Additional how-to documents on ChemCamps and SPICE are in the works.

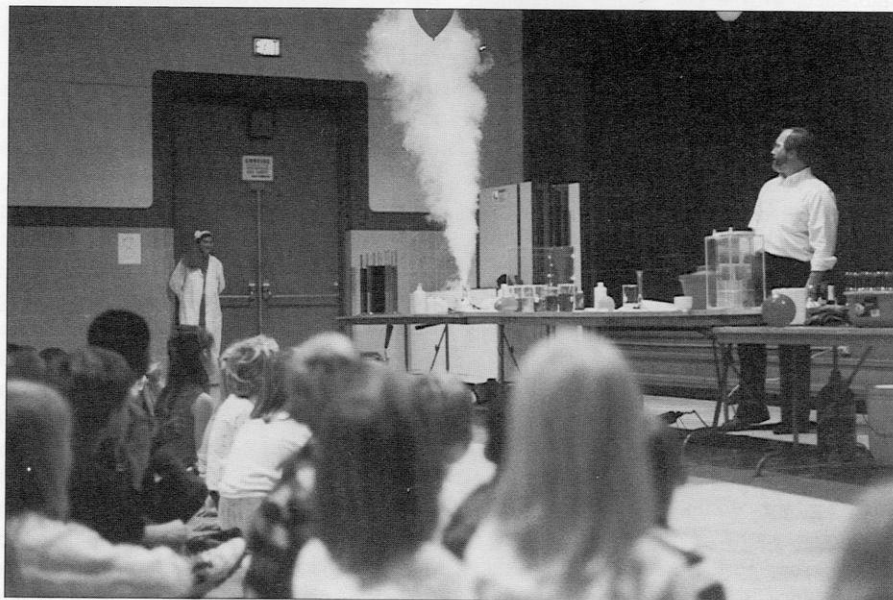
Topics in Chemistry aim to provide high school and introductory college teachers with succinct but complete and technically accurate discussions of areas where chemistry is applied to daily life and to environmental problems. Topics to date include 'Chlorofluorocarbons and the Hole in the Ozone Layer', 'Black and White Photography', and 'Acid Rain', written by ICE Fellow Anthony Jacob, a recent graduate of our department. Each has been reviewed by experts from industry, government, and other academic institutions as well as by members of our faculty. If you are interested in suggesting additional topics or in serving as a reviewer-contributor on a particular topic, please contact us.

Summer was again a busy time with many teachers in residence to attend ICE workshops. There was a new, and very successful addition — Fundamentals for Middle School Teachers. This was the most lively, enthusiastic, energetic, inquisitive group we have ever seen, and they (as well as their instructors) went away exhausted but recharged. Another

new wrinkle was that our ChemCamp for Kids went on the road, to Chicago State University. Our instructors report that this group was the most eager to learn of any they have seen. According to the evaluations, the program was a huge success with both parents and kids; the kids wanted to have another program so that they could bring their friends.

The SPICE Outreach program reached a record number of persons — about 14,000, mostly elementary and middle school students, in 95 presentations. SPICE presentations, built around a theme of chemical content (energy, acids and bases, etc.) provide an interesting and educational experience that will encourage students to choose a career in science. The program is carried out by teams made up of faculty, staff, graduate students, and undergraduates in chemical engineering and science education as well as chemistry. If any of you are considering setting up an outreach program, you will be interested to know that ICE will have a handbook ready for distribution soon.

The ICE mailing list continues to grow, and thanks to Editor David Shaw the ICE-Cycle Newsletter now gets mailed regularly, four times a year. The list includes teachers from elementary school through university, as well as some industrial chemists and graduate students; the common bond is an interest in improving science education.



SPICE presentation at Orchard Ridge Elementary School (Madison, WI) by General Chemistry Coordinator Gery Essenmacher and undergraduate Marion Toscano.

*Technology-Related Programs:***CATALYST & NOTEBOOK**

Modernization of the general chemistry program continues, taking advantage of the in house expertise in computer, videodisc, and multi-media technology that is a part of the above-named projects. Students now collect experimental data using computers, manipulate, analyze their results with a program called NOTEBOOK, and print graphs and data from the computer screen. One measure of the success of the NOTEBOOK program is that students who have moved on to their second year come back to use it.

Much of the software that is being developed here is available to persons at other institutions via ICE: Software, as a part of the CATALYST Curriculum. The software is being developed by UW faculty and staff and by CATALYST Fellows (faculty on leave from their home institutions), supported with funds from NSF. The hardware for development and for the computer lab has come from University of Wisconsin Laboratory Modernization funds and from the IBM Corporation gift to the department.

The CATALYST Curriculum software collection will eventually include:

- Volume I: Computer-Mediated Laboratories
- Volume II: Fundamental Principles and Practices
- Volume III: Descriptive Chemistry: Properties and Reactions
- Volume IV: Structure and Bonding in Atoms, Molecules, Solids, and Macromolecules
- Volume V: Chemical Equilibrium and Thermodynamics
- Volume VI: Chemical Kinetics and Reactivity
- Volume VII: Organic and Biochemistry
- Volume VIII: Industrial and Environmental Chemistry

When complete, each volume is expected to contain from ten to forty programs as well as ancillary videodisc (or CD or DVI) and written materials. Two major aims of the project are to make the laboratory more central to the curriculum and to reduce the size and length of textbooks while increasing their readability, both of which imply development of new kinds of written materials as well as the more obvious technology-based materials. •

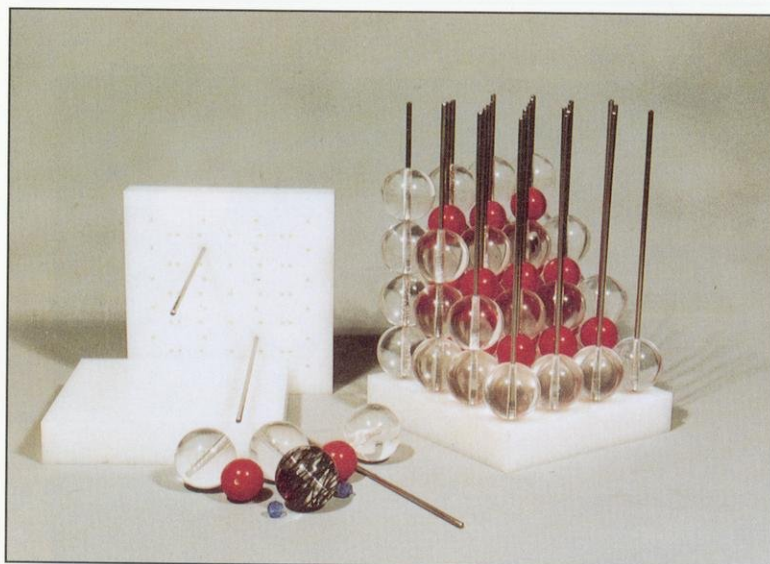


▲ Paul and Isabel Treichel, and John and Betty Moore at the Norris Award Banquet, Boston, Nov. 1991.



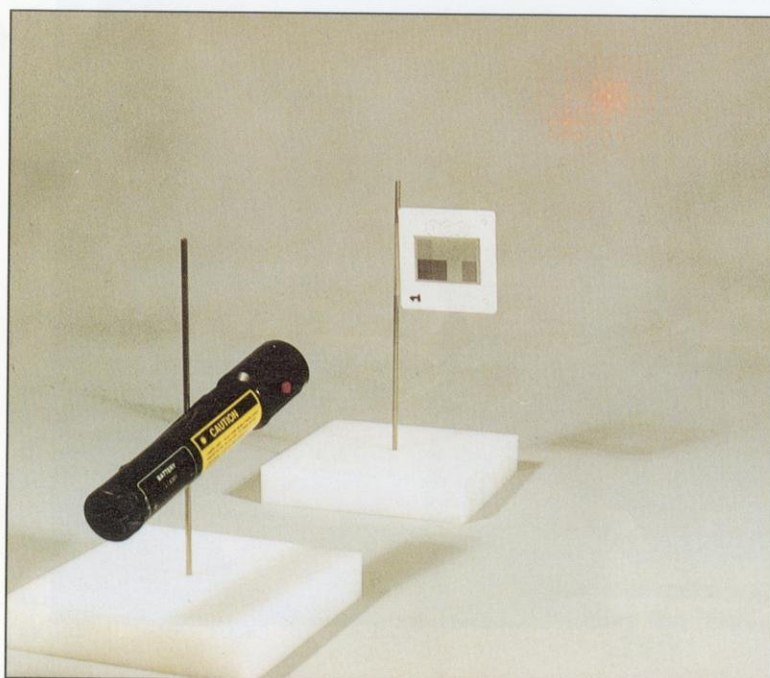
▶
Chuck and Martha Casey
at the ACS Award
Banquet in Atlanta, April
1991. Chuck received
the 1991 Award for
Organometallic
Chemistry at the
national meeting.





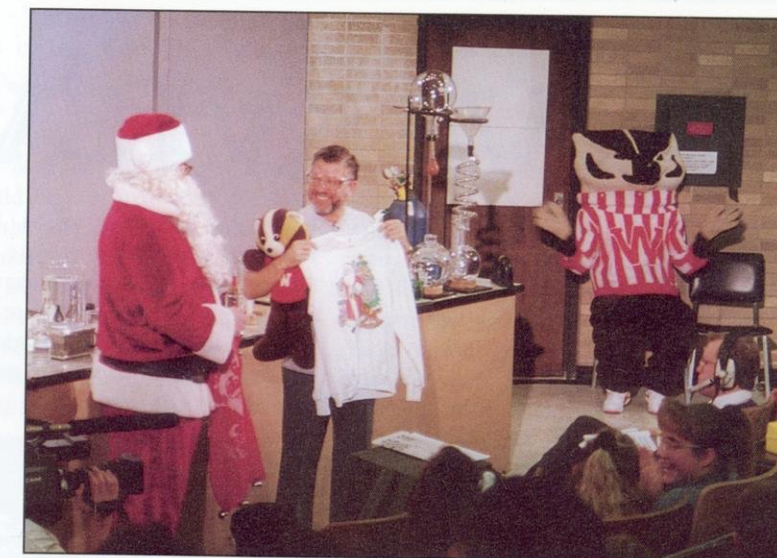
▲ ICE is collaborating with Art Ellis's solid-state curriculum development project to prepare a solid-state model kit from which students can build models of over 50 different types of structures. The kit consists of a plastic base into which vertical rods are placed. Plastic spheres whose radii are in appropriate ratios for octahedral and tetrahedral holes are slid down over rods to produce a crystal lattice model. Professor Ludwig A. Meyer of San Jose State University is spending a year as an ICE Fellow developing this kit (which he invented and on which he holds a patent) as well as pedagogical materials to accompany it.

▼ The ICE Optical Transform Kit was featured in the February, 1991 issue of the *Journal of Chemical Education*. The kit provides an interesting demonstration and laboratory experiment applicable to instruction on x-ray crystallography. The 35mm slide contains eight two dimensional arrays of spots; when visible light from the hand held laser passes through the array it produced a diffraction pattern on the screen. Measurements for the distances and angles of diffraction, with a value for the wavelength of light, are used to calculate lattice spacings. The Optical Transform Kit, with (\$100) or without (\$6) a laser, is available from ICE. REF: G.C. Lisensky, T.F. Kelly, D.R. Neu, and A.B. Ellis, *J. Chem. Ed.*, 68, 91 (1991).



Freshman students in Chemistry 116 in the spring semester, 1991, had the chance to work for the last six weeks on a mini-research project. Lori Thiess and Shannon Kaub worked with Isabel Treichel (Director of the Isotope Ratio Mass Spectrometry Lab), and Professors Margaret Schoeninger (Anthropology) and Mark Cook (Poultry Science), on Project CACKLE (Chemistry and Anthropology Combine for Knowledge, Learning, and Education) involving diet reconstruction. Laying hens were fed carefully controlled diets of protein and carbohydrate

derived from specific sources (corn, wheat for which the C_{12}/C_{13} and N_{14}/N_{15} ratios differ), and the isotope ratios in the membranes and shells of eggs were analyzed using mass spectrometry. Variations in measured isotope ratios were then correlated with the isotope ratios of the dietary components. Lori and Shannon have continued to work on this project in 1991-92; publication and presentation of results at undergraduate research symposia are expected during 1992. Both students are now considering future research careers based on their positive lab experiences.



▲ Professor Bassam Shkhashiri presented his 22nd Christmas Lecture at Madison in mid-December, then gave repeat performances in Washington and Boston. His Washington lecture on December 16 was taped to be shown later on PBS. Bassam took the opportunity to lecture to commemorate the 200th anniversary of the birth of Michael Faraday. Faraday was noted for his Christmas lectures at the Royal Institute of Great Britain in the 1840's.

▼ Public lectures were popular even before Faraday's time. The James Gillray caricature from 1803 was provided by Aaron Ihde from his collection of historical material; it may also be found in Ihde's "*The Development of Modern Chemistry*", Dover Publications, 1984, page 128. The lecturer is presumed to be Thomas Garrett, first professor of chemistry at the Institute; Humphrey Davy is holding the bellows and administering nitrous oxide to a volunteer from the audience.





THE VERVIEW

WISTAR approved... Pres. Shaw resigns... \$40M budget Shortfall... Business School construction. . .

Nineteen ninety-one — it was an interesting year. For most of us in the Chemistry Department, the highlight was the approval of the WISTAR Program, a significant step forward on our new building (article, page 8). There were many other developments as well, including some important developments involving personnel that are reported elsewhere (Faculty & Staff News, page 3). With these news items factored out, let us look at other developments during 1991.

University News

The UW system lost its President when Buzz Shaw announced in late April that he had accepted a similar position at Syracuse University. He had headed the UW System since 1985. Vice President Katherine Lyall became Acting President and a search committee was formed in early fall to seek a successor. No timetable has been mentioned and at this time, the committee is still seeking candidates.

The State went through its biennial budget assessment during spring and summer to establish the state's budget for the next two years. As one might expect, the University is one of the largest entries in this budget. Not surprising considering the economic climate, salary raises were low, 1% in the first year. Tuition increased by 3.4%. There were very modest funding increases for S & E, laboratory modernization, library improvements, and engineering and technology programs. None of these additions to the budget trickled down to Chemistry. Most directly important to our department was the approval of the WISTAR Program major building program for university science and technology related facilities.

What didn't get funded in the state

budget has been bigger news. In presenting their needs to the state, the UW System had elected a new strategy: there was a set of needs that were so urgent that, if the state failed to add funds to the budget or to approve a much higher tuition, the UW would have to reallocate



THE OLD RED GYM

existing resources to meet them. Over half of the funds were for faculty and staff salaries and S & E, two very contentious issues at the legislature. When funds were not forthcoming (some said predictably), the UW had little choice but to continue on its designated course.

The indicated shortfall for the UW system was \$40 million, and the UW Madison share about a third of this total. The University is preparing a plan to reallocate existing resources over the next three years. The program took on a new name, "Quality Reinvestment."

While most information on this topic

is not yet well defined, the problem is said to equate to not replacing about a third of the faculty and staff who will leave the university over the next three years. The University would decrease in size, and the resources freed up would become available to improve the quality of the program. This fit well with an ongoing program to decrease the number of students on campus. In fall 1991, the "Full Time Equivalent" enrollment was 37,022, a 1.3% decrease from the previous year. (The actual headcount at

UW-Madison was 43,196; the FTE that prorates part-time students is used as more accurate measure of the size of the program.)

There is at least some hope here that Chemistry may come out a winner in this exercise. Unlike most L & S departments, we are understaffed. We need to bring in several visitors each year to meet teaching needs. Our salaries are low relative to peer institutions. Furthermore, we are a highly ranked department. On the other hand, the university has a tradition of spreading both burdens and wealth among colleges and departments. We will look forward to seeing how Quality Reinvestment plays out.

Other newsworthy items:

- Two building projects on campus have been receiving a large amount of publicity. First the UW has pushed hard for funds to remodel the Armory (the "Old Red Gym" on Langdon Street) into a student services center. Planning money for this project has been included in the budget. Second, the roof of

Science Hall the red brick building on Park Street, (opposite the Union) needs to be replaced. The UW would like to use slate to replicate the existing roof of this historical landmark, at a cost of \$1.3M; however, the State appropriated \$0.7M for asphalt shingles that will look like slate. The debate on this continues.

- The UW Business School has started construction on its 285,000 square feet, \$31M building bound by University Ave., Brooks St. and Johnson St. One block east of the Chemistry Building, this project is a good reminder of what is to come in Chemistry.

- On April 1 the University adopted a new smoke free policy for university buildings. The faculty and staff that smoke must now go outside for breaks.

- A contract agreement between the TAA (Teaching Assistants' Association) and the State was reached in June after almost a year of negotiation.

- A Committee, set up in February to review Biological Science Programs on Campus, issued its report in November. Among other things, the Committee called for major restructuring within the UW that would bring together various programs and departments from diverse parts of campus, new facilities construction, and increased state and UW support. At least a few people here suggested that the chemical sciences might benefit from a similar proposal.

- Finally, as 1991 reached a conclusion, the spectre of overhead problems appeared in local newspapers. A state audit reported that certain questionable items (entertainment, public relations costs) were included to federal grant overhead cost, while other allowable items were omitted. Most faculty here, while regretting the whole concept of overhead to various degrees, thought we were immune to the problems that have surfaced on other campuses, since the UW has one of the lowest overhead rates (44% of all direct costs, except tuition remission and capital equipment). UW Madison officials quickly pointed out that, until last January, negotiations on overhead were carried out by the UW System, and not by the Madison Campus. We will undoubtedly hear more on this subject over the next few months.

DEPARTMENT NEWS

IN BC-35, we reported that graduate student stipends at Wisconsin were low relative to peer institutions and that this was having a negative impact on our program. The department has moved ahead to address this problem, with a plan to supplement student stipends. All students entering in August, 1991 received a \$2,000 supplement to their TA or Fellowship stipend, while students starting their second and third years were granted a \$1,000 supplement. The supplements had a dramatic effect on the size of our entering class. We had planned to reduce the number of graduate admissions to between 40 and

45 students in fall, 1991. This number is based on an assessment of resources available. In fact, over 50 students started here in the fall.

Concerns over having more students than we could support were averted, however, when the Department of Education funded a proposal providing fellowship support for 24 students in chemistry and materials science. The funding received more than offset the increased expenses of a larger than expected class. The proposal, prepared by Art Ellis and Phil Certain, was submitted to the DoEd's National Needs program. Its focus was to increase the diversity of the student body while increasing the interaction between chemistry and materials science.

Stipend supplements for first year students in their first semester came from gift funds. During the second semester, the supplements for these students were provided from research grants. This was done by increasing student appointments from 50% to about 58% time. Similarly, supplements for second and third year students were provided by this mechanism. About one-third of the cost of this \$200,000 program was borne by the department and two-thirds by individual research groups.

We expect that this supplement program to continue until the University provides relief by setting competitive graduate student stipends. There is some pessimism about this happening in the near future.

There was another important spinoff of this subject. At the end of January, Professors Trieche and Harriman met with current graduate students to explain the department's plan for supplementing stipends. Only about 30 students attended what turned into a rather stormy session, with the students presenting some highly critical comments about certain aspects of the department. The most obvious general problem was a lack of satisfactory communication with the students. It was also the easiest to remedy.

Responding, the Department moved to create a Graduate Student-Faculty Liaison Committee. Actually a similar committee had a short life in the seventies. The committee is made up of two representatives from each of the Divisions, two from the first year class, and four faculty members, with Professor Trieche as Chair. Membership of this committee was chosen by vote of the students. The committee has met monthly since May.

The GSFLC has taken leadership on a number of issues. Graduate student membership on certain departmental committees was an initial issue. The Department agreed to the GSFLC's proposal to have students on the Computer, Laser Lab, Library, Safety and Shops Committee, and on several committees that direct the Instrument Center. The GSFLC also researched and wrote up a document giving a clear explanation of student stipends which we now use. •

B

CONTROLLING THE COURSE OF CHEMICAL REACTIONS with laser light has intrigued chemists since the invention of the laser. In the last two years, Professor Crim and his research group have demonstrated such "bond-selected" bimolecular chemistry for the first time. (The initial report of the work was in *J. Chem. Phys.* 92, 6333 (1990), followed by other papers. One general description of the work appears in *Chemical and Engineering News*, June 25, 1990.) In their experiments, Crim, post-doctoral associate Amit Sinha, and graduate student Mark Hsiao excite an O-H stretching vibration in isotopically substituted water (HOD) and react only the excited molecules with H atoms from a microwave discharge. They demonstrate the bond-selectivity by using another laser to detect the OH or OD products. They find *only* OD products, demonstrating the preferential cleavage of the vibrationally excited O-H bond. These experiments grew out of work on selectively photodissociating vibrationally excited molecules, and they point the way to new research on the control of chemical reactions. ♦

C

NEW BADGER CHEMISTS

PHD

ADOLF, DAVID B.

(EDIGER) Local Segmental Dynamics of Polyisoprene: Computer Simulations and Time-Resolved Optical Experiments.

ANDERSON, DAVID J.

(ELLIS) Synthesis Characterization and Photophysical Investigation of Some New Rhenium (I) Complexes.

BALENDIRAN, GANESARATNAM

(O'LEARY) Molecular Structure of d(CGCGTTAACGCG) in the Netropsin-Bound and Netropsin-Free Orthorhombic Crystal Form.

BARNER, BARBARA

(CORN) Studies of Organized Monolayers and Thin Films at Electrode Surfaces by Vibrational Spectroscopy.

BARR, MARY

(DAHL) Syntheses and Stereophysical Analyses of Several Metal Polyphosphido and Triangular Iron Nitrosyl Complexes.

BORST, JOSEPH P.

(REICH) I. Stereochemistry of the Lithium/Tin Exchange. II. Ion Pair Structure of Lithium Species in THF/HMPA Solution.

BREITER, DEBORAH

(HOLDEN) The Molecular Structure of a High-Potential Iron-Sulfur Protein.

CRAIN, PATRICK M.

(SCHRAG) Polymer/Solvent Interactions as Revealed by Dynamic Viscoelastic and Oscillatory Flow Properties for Polystyrene Solutions.

DUEVEL, ROBERT V.

(CORN) Vibrational Studies of Organized Monolayers and Thin Films at Metal Electrode Surfaces.

ELLING, JOHN W.

(FARRAR) The Development of a Low Field Fourier Transform Ion Cyclotron Resonance Spectrometer Mass.

GALANTE, ROCCO

(VEDEJS) Azocines Via Sulfur Mediated Ring Expansions.

GLENDENING, ERIC

(WEINHOLD) Natural Resonance Theory and Studies of Electronic Delocalization in Molecules.

HARRINGTON, JOEL E.

(WEISSHAAR) High Resolution Photoelectron Studies of Vanadium Monoxide

JOHNSON, BRIAN S.

(EDIGER) Concentration Dependence of Molecular Motions in Tetrahydrofuran Solutions of Polyisoprene and Polystyrene.

LEUNG, LARRY K. W.

(ELLIS) Steady-State and Time-Resolved Photoluminescence Studies of Semiconductor-Derived Interfaces.

LYNCH, MATTHEW L.

(CORN) In Situ Second Harmonic Generation Studies of Adsorption and Structure at Pt (III).

MA, CHEUK KI

(DAHL) Synthesis, Characterization and Stereochemical Bonding Analysis of Iron Nitrosyl Chalcogenide Clusters.

MCCLAIN, ROBERT L.

(WOODS) The Development of Diode Laser Infrared Absorption Spectroscopy as a Plasma Diagnostic.

McKILLOP, KIRSTEN

(WEST) The Structure, Rearrangement and Reactivity of 1,2-Di-tert-butyl-1,2-dioxetane and the Oxidation of Disilenes.

MERTZENICH, CLAUDE L.

(ELLIS) Cyclodextrin Inclusion Complexes of Tetramethyl-1,2-dioxetane and Tetrachlorotetrakis(trimethylphosphine)-dimolybdenum (II).

MILLEVOLTE, ANTHONY

(WEST) Synthesis and Photochemistry of Organosilicon Compounds.

MUYSKENS (CARLSON) KAREN J.

(CRIM) The Photodissociation of Nitromethane Using Energy-selective Electron-impact Ionization and Time-of-flight Mass Spectrometry.

NEDER, KAREN M.

(WHITLOCK) The Synthesis and Complexation Behavior of A Series of Pyridine-containing Tribridged Naphthalenophanes.

OLMSTEAD, MARTHA

(RECORD) Grand Canonical Monte Carlo Analysis of the Thermodynamics of Processes Involving Oligomeric and Polymeric DNA.

PARKER, MARSHALL H.

(BURKE) Effort Directed Toward the Enantioselective Synthesis of Ircinianin.

PETILLO, PETER A.

(NELSEN) I. Spectroscopic and Theoretical Investigations of Hydrazine. II. Calculation of Marcus's by Ab Initio Methods.

PIOTROWSKI, DAVID W.

(VEDEJS) Intramolecular Cycloadditions of Azomethine Ylides Generated from 4-Oxazolines: A Route Directed Toward the Aziridinomitosene Skeleton.

PORTER, WARREN J.

(BURKE) The Preparation, Structure, and Cation Binding of a Series of Chiral Symmetric Macrolides Composed of Hydropyran Subgroups.

SHAFFER, BARRIE A.

(WOODS) Rotational Spectroscopy of Transient Molecular Species.

SMITH, SCOTT K.

(FARRAR) Solid State NMR Measurements of ^{31}P Chemical Shift Tensor and the P-H Bond Distance in Phosphites.

SONNEN, WAYNE E.

(VAUGHN) Dielectric Behavior of DNA Oligomers.

SPOLAR, RUTH M.

(RECORD) The Role of the Hydrophobic Effect in Site-Specific Protein-DNA Interactions and Protein Folding: A Thermodynamic Analysis Using Model Compound Transfer Data.

UTZ, ARTHUR L.

(CRIM) Laser-Double-Resonance Studies of State Mixing, Energy Transfer, and Electronic Spectroscopy in Highly Vibrationally Excited Acetylene.

WRIGHT, CHARLES

(ZIMMERMAN) The Synthesis and Photorearrangements of Triplet Acylcyclopropanes and Benzoylcyclopropene Imines.

YI, CHAE SUNG

(CASEY) Synthesis and Reactions of (π -Allenyl)rhenium Complexes.

YOON, HICHANG

(YU) Self and Probe Diffusion of Polyelectrolyte in Complex Media

MS

FRANK, NATIA L. (WOODS)

FRAIJI, ELIE K. (RECORD)

KORZENECKI, PHILIP (ZIMMERMAN)

MELVILLE, MARGARET G. (CASEY)

MITCHELL, MELISSA B. (NATHANSON)

RITO, CHRISTOPHER J. (GELLMAN)

SPORY, PHILIP J. (RECORD)

SULZBACH, HORST M. (ZIMMERMAN)

BS

ABRAMS, MICHAEL B.

ANDERSON, KIRSTEN P.

ARVEDSON, STEPHEN P.

AUSLOSS, DAVID A.

BASTYR, JACQUELINE M.

BELETE, MICHAEL E.

COULTER, BRANNON A.

ESKER, ALAN R.

EVELAND, JEFFREY R.

IRVING PAMELA E.

KINNING, LISA L.

KOTCH, JENNIFER

LANG, CARYN S.

LUDOWISE, PETER D.

MILLER, STEPHEN C.

MORT, NICHOLAS A.

MULLER, JOSEPH L.

MURPHY, SEAN T.

MYERS, TERESA A.

NATROP, STEPHEN P.

NORRIS, TRACY B.

PAWELA, JOSEPH F.

POWERS, RYAN E.

ROHLINGER, JEFFREY D.

ROSE, PETER E.

SADRZADEH, NEGAR

SAGER, JESS W.

SCHATZ, ROBERT T.

SLATTERY, BRIAN J.

SPAULDING, THOMAS F.

STRANGMAN, GARY E.

STRUTHERS, MARY D.

STUDER, PETER C.

Student Honor Role

Peter Petillo (Ph.D. '91 Nelsen) was one of four UW-Madison campus recipients of Sigma Xi awards for outstanding Ph.D. theses. Peter holds a postdoctoral appointment with Prof. Lerner.

The Charles N. Reilly Award for the outstanding Analytical Chemistry Student in the department went to **John Luckey**, a fourth year graduate student working with Professor Smith.

Todd Underiner, a graduate student working with Prof. Casey, was recipient of a graduate fellowship awarded by the Division of Organic Chemistry of the ACS and funded by Dow Chemical Co.

Steve Govoni was the recipient of an IBM Fellowship. Steve completed his BS degree at the U. of Illinois in 1988. Steve is a graduate student in Professor Nathanson's group.

Mackenzie King received a Canadian National Science and Engineering Research Council Fellowship for 1991-2. Mac is a third year student with Professor Nathanson; he did undergraduate work at Middlebury College.

We are pleased to report that 1991 NSF Doctoral Fellowship awardees included first year doctoral students **Steve Brown** ('89 Dartmouth, McMahon) and **Randy Seburg** ('90 Baylor, Crim). UW-Madison, undergraduate chemistry majors **Steve Arvedson** and **Mary Struthers** were also chosen to receive NSF fellowships in that competition. Steve was an undergraduate researcher in Steve Burke's group; Mary worked with Lloyd Smith.

1991-2 Graduate Fellowships Awards

Kevin Kott (BS '88, Aurora IL College, McMahon) Amoco Fellowship; Dan Higgins (BA '88, St. Olaf College, Corn) W.R. Grace Fellowship; Donald Parsons (BA '87, Dartmouth College, Schrag) P & G Fellowship; Michael Kort (BS '87, Hope College, Burke) Squibb Fellowship; Arthur Cammers (BS '88, UW-Eau Claire, Vedejs) Squibb Fellowship.

1990-1 Outstanding TAs

Peter C. Ellingson (BS '89, UW-La Crosse, Yu); Maria T. Jesena (BS '89, U. of Michigan, Schrag); Yuntao Song (BS '82, U. of Shandong, China, Burke); James B. Thoden (BS '87, Iowa State, Dahl); and Alison J. Whoolery (BS, MS '89, U. of North Dakota, Dahl).

AWARDS ♦ AWARDS ♦ AWARDS

Fleming Crim was selected to receive a Chancellor's Award; this is one of 10 teaching awards given annually by the university. The award was presented April 29, 1991, with appropriate fanfare, at a reception held at the State Historical Society. He is the sixth department faculty member so honored. Fleming has taught undergraduate physical chemistry lecture and lab and graduate courses in kinetics. More recently he taught the non-major general chemistry course, Chemistry 103.

Larry Dahl was named to a Hilldale Chair. Four of these awards are made each year, one each in the Divisions of Physical Sciences, Biological Sciences, Humanities and Social Studies. This was the department's second consecutive successful year in this competition. Howard Zimmerman having been named to a Hilldale Chair in 1990. The award provides research funding for a five year period.

The Department continued to find success in the Presidential Young Investigator Award competition with **Sam Gellman** being among 16 PYIs in chemistry selected in March. Sam's research program has progressed very rapidly. Four papers in JACS, two in other journals, and two papers written and in press during 1991 attest to both the size and quality of his program. His current group, which includes 14 graduate students and one undergraduate, is funded through NSF, ONR, NIH, and the American Cancer Society. Sam was previously designated a Searle Scholar.

John Moore was named recipient of the 1991 James Flack Norris Award in Chemical Education. Given by the Northeastern Section of ACS, the Norris Award is one of the oldest ACS awards. This is the second award in as many years for John; last year he received the ACS's Pimentel Award in Chemical Education. He is the third Wisconsin Chemist to receive this award. Farrington Daniels was the recipient in 1957 and Bassam Shakhshiri was the winner in 1982.

It was announced at the EDUCOM '91 conference held in San Diego, Oct. 19, that **Paul Schatz**, Organic Chemistry Laboratory Director, was one of the 100 winners of the Joe Wyatt Challenge for his project, 'Instrument Simulators'. This project is designed to demonstrate how

information technology can help achieve goals at universities and colleges. Paul was one of only three winners asked to speak at the conference on his project.

The department was pleased to learn that **Jim Weisshaar** had been named as the 1991 Romnes Faculty Fellow awardee in Physical Sciences. Romnes Fellowships are awarded each year by the Graduate School. The award competition is restricted to faculty in the four years following promotion to tenure. Intended to give a significant impetus to a research program at a critical time, the Romnes Fellowships provide unrestricted research funding from the Graduate School.

John Wright received the ACS Division of Analytical Chemistry Award in Spectrochemical Analysis. Sponsored by the Perkin Elmer Corp. John presented a talk at the award at the New York ACS meeting.

Also in 1991

NAMED Fellow of the American Physical Society: **Claude Woods**, 'for the development of rotational spectroscopy of molecular ions, leading to precise determinations of molecular structures, identification of molecular ions in the interstellar medium, and diagnostics of laboratory discharge plasmas.'

Elected Fellow of the American Association for the Advancement of Science: **Chuck Casey**, 'for Research on the mechanisms of organometallic reactions and in developing an understanding of homogeneous catalysis'; **Tom Record**, 'For research on the physical chemical basis of gene expression, particularly experimental and theoretical studies of thermodynamics and mechanisms of protein, ligand, and citation-DNA interactions'.

Ron Perkins, a teacher at Greenwich, CT High School, and a member of the ICE board and an instructor in the ICE summer program almost from its inception, was recipient of a national CMA Catalyst Award.

Professor **Brock Spencer** of Beloit College was also honored in this fashion; Brock has had a long association with our department that started with a leave of absence spent in Madison and then continued with research collaboration with **Art Ellis**. •

THIS 'N' THAT

This 'n That is your feature,
so please keep sending us news!
We always enjoy hearing
from our alumni.

Sukumar Aditya (Visiting Scientist '54, '65, '77, Willard) retired from his position as professor at the University of Calcutta in Jan., 1991.

Bob Alberty (Ph.D. '47, Williams, and a former faculty colleague and later Graduate School Dean) became an Emeritus Professor at MIT in July, 1991. The next edition of *Physical Chemistry*, coauthored with **Robert Silbey**, will be out in Nov., 1991.

Donald Ames (Ph.D. '49, Willard) recently retired as Vice President for research at McDonnell Douglas, has invented and patented an oil monitor based on fluorescence for use in autos, trucks, and tractors.

Eric Amis (Ph.D. '81, Yu; Postdoc '83-'84, Ferry) was promoted to Associate Professor with tenure at U. of Southern California.

David Anderson (Ph.D. '91, Ellis) is at Allied Signal, Des Plaines, IL.

Michael Anderson (BS '70, MS '72, Haskin) worked in Madison and then at the UW-Parkside, went on to earn a Ph.D. in Environmental Science and Engineering the Oregon Graduate Institute, and is currently employed by the Oregon Dept. of Environmental Quality.

Sue Boettger (BS '74, Ph.D. '79 Cornell) has been at Bristol-Myers Squibb for the last 10 years in the Process Exploration Laboratory, working on antibacterial and antiviral compounds.

Gerald Meyer (Ph.D. '90 Ellis) is an assistant professor at Johns Hopkins University.

Rafael Arce (Ph.D. '70, Willard) is Dean at the University of Puerto Rico at Rio Piedras. He is involved in research involving nanosecond laser photolysis of nucleic acids.

Roland Aubey (BS '49), retired from Nekoosa Paper in Oshkosh, WI two years ago, has stayed on as volunteer to develop standard test methods specifications for paper.

Herbert Benson (Ph.D. '70, Willard) recently retired from his position with Shell Oil Co.

Benjamin Bierer (MS '69, Willard) is retired from his teaching position and is living in Dallas.

Steve Bittenson (Ph.D. '77, Berry) is currently manager for Laser Research and Development at Summit Technology in Waltham, MA.

Gary Blanchard (Ph.D. '85, Wirth) is now Assistant Professor at Michigan State.

Carl Blesch (BS '74) writes that he is now a science writer, in public relations at AT&T.

Rebecca Braslau (Ph.D. '90, Trost) is a new assistant professor at the U. Cal. at Santa Cruz.

Bruce Brown (Postdoc '74, Willard) is now Head of Weapons Systems Research Laboratory of the Australian Defense Science and Technology Organization.

Ed Carberry (Ph.D. '68, West) received the *Minnesota Outstanding College Educator* award, given by the Minn. Science Teachers Assoc. and the Minn. Academy of Science, in 1990. He led a delegation of chemists and scientific glassblowers to the Soviet Union in 1990 and will return to teach in the Mendelev Institute for a month in 1992. The second edition of his book on glassblowing is being translated into Russian and will be published in the CIS.

Rod Claridge (Postdoc '63-'66, Willard) spent 9 months at the University of Osaka while on study leave from his faculty position at University of Christchurch, New Zealand.

William Cartwright (Ph.D. '68, Muxfeldt) is entering his tenth year with Kimberly Clark Corp. and has been recently been promoted to Associate Research Fellow.

William Childs (Ph.D. '55, Bender) took early retirement in August, 1990 from Carleton College. He had taught there for 29 years, and had spent the last five years as Associate Dean of the College. He is pursuing long deferred travel, has enrolled in a program for an MA degree in Liberal Studies at Hamline University, and is taking bassoon lessons.

Ed Clennan (Ph.D. '77, Nelsen), is spending a year away from the U. of Wyoming as rotator in Chemical Dynamics at NSF.

Sheldon Cohen (BS, '56), Professor of Chemistry at Washburn University, Topeka KS, has been appointed Executive Director of Planning.

Byron Cotter (Ph.D. '74, Zimmerman) was an interviewer at Wisconsin for the Lever Company.

Armand deRosset (Ph.D. '39, Williams), retired as Director of Separations Research from UOP in 1980, has continued to work as an Adjunct Scientist at Sarasota's Mote Marine Laboratory, developing new methods for analysis of the polycyclic ether toxins generated by Red Tide organisms.

Emilio Diaz (Ph.D. '86, O'Leary) is an assistant professor at the University of Puerto Rico at Mayaguez, teaching organic and biochemistry and doing research on enzyme reaction mechanisms.

Susan (Dullum) Hill (BS '85) has worked at the Wis. State Lab for the last 5 years as an environmental chemist, analyzing samples for heavy metals.

Eric Eisenhart (Ph.D. '86, Reich) completed a two year Wharton Management program. He and **Joann Eisenhart** (PhD '86, Ellis) are still at Rohm and Haas, and Joann continues her role as a recruiter at the UW, a task shared by **Phelps Johnson** (Ph.D. '87, Ellis) and **Ed Greer** (Ph.D. '82, Taylor).

Keith Woo (Postdoc '85-'86, Casey) returned to Madison in April, 1991 to present a seminar on his research on metalloporphyrin complexes. He is currently an assistant professor at Iowa State.

Paul Lamers (Ph.D. '90 Zimmerman) visited this fall as a PPG recruiter.

Larry Leung (Ph.D. '91, Ellis) has joined the technical staff of Dowell Schlumberger, Tulsa, OK.



Peter Dorhout (Ph.D. '89, Ellis) has finished a two year postdoc with **John Corbett** at Iowa State and is now Assistant Professor at Colorado State at Fort Collins.

BC-35 relocated **Julie Elward-Berry** (Ph.D. '78, Berry) in Houston. She is at Exxon Production Research Co. where she is working as a colloid and polymer chemist on drilling research, in the *upstream* end of the petroleum industry. She spends some time on site in the Gulf of Mexico, and travels overseas at least once a year (to places like Aberdeen, Scotland, Norway, and Australia).

Edward L. Engelhardt (Ph.D. '44, McElvain) joined Sharp and Dohme after receiving his degree. His work there in the area of medicinal chemistry continued for more than 44 years, and he held a succession of responsibilities including Senior Director (1975-9) and Distinguished Senior Scientist (1979-88).

David Engler (Ph.D. '77, Vedejs) is currently the Technical Manager of the Personal Safety Products Laboratory at 3M.

Donald Ernst (BS '52, MS '53, Ph.D. '56, Holt) retired from the Naval Surface Warfare Center Jan., 1990 after 30 years of service.

Herbert Espy (Ph.D. '56, Goering) retired in June of 1991 from the Hercules Research Center.

Betty Fritz (BS '41) returned to Madison earlier this year to attend her Class of 1941's fiftieth reunion; she reports that five other chemistry course students were in attendance.

Steve Filseth (Ph.D. '62, Willard), a faculty member at York University in Toronto, is spending his 1991-2 sabbatical at Stanford.

J. Calvin Giddings (Postdoc, Hirschfelder), a faculty member at the University of Utah, received the 1991 Nichols Medal, presented by the New York Section of the ACS.

Ken Fivizzani (Ph.D. '81, Treichel) was promoted to the position of Good Lab Practices-Lab Chemical Hygiene Administrator at Nalco. His role is to assist departments at Nalco in achieving compliance with EPA and OSHA mandated requirements.

Robert Frankenthal (Ph.D. '56, Shain) was recently elected Vice President of the Electrochemical Society.

Cyrell Gerson (MS '71, West) is currently Manager of Media Courses for the ACS Continuing Education Division.

Rich Givens (Ph.D. '67, Zimmerman) is chair of the Chemistry Department at the U. of Kansas.

Jeff Gold (BS '78), now Assistant Chairman at Duke, sent a copy of Duke's first (alumni) newsletter for which he is a coeditor.

Janet Wisniewski Grissom (Ph.D. '87, Vedejs) just completed her first year as an assistant professor at the University of Utah. Her husband, **Chuck Grissom** (UW Ph.D. in Biochemistry) is also an assistant professor there. She observes that, with **Fred West** (Ph.D.

'86, Vedejs) and **Gary Keck** (Ph.D. '75, Zimmerman) also on the Utah faculty, Wisconsin chemists make up almost half of the organic division at Utah.

John Helms (MS '43, Johnson) retired in 1980 from the position of Associate Director of Research at the American Can Company.

Scott Hanton (Ph.D. '90, Weisshaar) is a staff scientist at Air Products.

I·N·M·E·M·O·R·I·A·M

Robert M. Bock (BS '49, Ph.D. '52, Alberty) died July 2 following a drowning accident. Bob spent almost his entire career at Wisconsin. He was a Biochemistry Department faculty member and Dean of the Graduate School from 1967 through 1989. He performed basic studies that helped lay the foundation for deciphering the Genetic code and was the first to crystallize tRNA, a keystone molecule in the process of protein synthesis. As Dean, he presided over the remarkable growth of the UW's research activity. At the time of his retirement in 1989, he had overseen two-thirds of the graduate degrees and 90% of the research funding at Wisconsin. In September 11, a memorial service attracted about a thousand people to the Union Theatre.

Roger Carlson (Ph.D. '87, Wright) died November 29, 1991 in Los Alamos, NM. After receiving his degree from Wisconsin, he had held postdoctoral appointments at the University of Chicago and Los Alamos National Labs.

Anthony 'Ted' DiFiore, 53, died Sunday, August 18, 1991. Ted was a Research Instrumentation Innovator in the Chemistry Department Instrument Center; he had worked in the department since 1968.

George Hood, Jr., 62, (BS '48, Ph.D. '51, Krauskopf) died on May 8, 1991. He was retired from Shell Oil Company, having worked in California, Texas, Louisiana, and Holland. He was living in Sturgeon Bay, WI at the time of his death.

Nels Minne, 89, (MS '30, Ph.D. '32, Adkins) died June 2, 1991. He began his career at Winona, MN State College in 1932 as an Instructor of Chemistry and Physics. Later, he became chairman of the department. He was President of Winona State University from 1944 to 1967.

John Haberman (Ph.D. '75, Bernstein) reports that he is still working for NASA at the Goddard Space Flight Center; current projects include the Galileo, CRAF (Cometary), CASSINI (Saturn and Titan) and Mars Rover missions.

Suzanne Harris (Ph.D. '72, Fenske) joined the faculty at the University of Wyoming. During the spring semester, 1990-1, she was a visiting Associate Professor at the UW.



Casey Group Reunion

The Casey research group held a reunion at the Atlanta ACS Meeting in April, 1991 in conjunction with the presentation of Chuck's ACS Award in Organometallic Chemistry. On Sunday night, over 40 former students and postdocs attended a dinner at the Mansion restaurant in Atlanta. The group presented a plaque to Chuck with the names of all the group members. On Monday, Professor Joe O'Conner (Ph.D. '84), now at the University of Nevada-Reno, chaired a symposium at which former Casey group members presented papers. Those presenting papers, besides Joe, included: Chae Yi (Ph.D. '91, now a postdoc at Penn State), Ruata Bly of the University of South Carolina (postdoc, '84), Bill Jones of the

University of Rochester (postdoc '80), Professor Fred Askham of the University of Delaware (postdoc '87-'88), Seth Marder of the Jet Propulsion Lab of Cal Tech (Ph.D. '85), Dean Roddick of the University of Wyoming (postdoc '84-'85), Mark Cesa of BP Research in Cleveland (Ph.D. '79), Laura Smith Vosejпка of Alma College in Michigan (Ph.D. '89), Al Shusterman of Reed College in Oregon (Ph.D. '81), Hideo Nagashima of Toyohashi University in Japan (postdoc '85-'86), Bill Moles of Lafayette College in Pennsylvania (Ph.D. '84), Morris Bullock of Brookhaven National Laboratory (Ph.D. '84), Kevin Gable of Oregon State University (postdoc '87-'88), and Keith Woo of Iowa State University (postdoc '85-'86).

John Hettinger (Ph.D. '66, Blaedel) is supervisor of Chemical Characterization for Lockheed Missiles and Space Co., Sunnyvale, CA.

Murray Katcher (Ph.D. '75, Treichel) was recently appointed Director of Community Health Programs and Associate Professor of Family Medicine and Practice at the UW-Medical School.

John Howatson (Ph.D. '50, Larsen) and his wife Trudy spend their winters near Brownsville, TX. They hosted the Larsens during their recent tour of south Texas.

John Hyndman (Ph.D. '50, Bender) retired in 1984 after 12 years at Rohm and Haas and 23 years at Goodyear Tire.

Janet Hyre is currently at the Washington Department of Ecology Labs at Manchester, WA. She is quality assurance officer and also supervises client services.

Dan Kapp (Ph.D. '85, Nelsen) is now a recruiter at Wisconsin for Eastman Kodak. He replaces another Wisconsin alumnus **Steve Neumann** (Ph.D. '78, Casey) who had previously represented Kodak for a number of years.

William Jensen (BS '70, Ph.D. '82, Larsen), Professor at the University of Cincinnati, was in Madison in November to attend a joint meeting of the History of Science Society and the Society for the History of Technology, held here in recognition of the Centennial Anniversary of the UW History of Science Department.

Richard Johnson (Postdoc '78-'79, Zimmerman) was promoted to full professor at the U. of New Hampshire.

Tom Johnson (MS '44, Ph.D. '46, Wilds) retired in March, 1990 from Sterling Drug, where he worked as a patent agent.

Hong Yol Kang (Ph.D. '66, Willard) has been appointed President of the Korea Science and Engineering Foundation, Taejon, Korea.

Michael Kellogg (BS '68) is Director, Exploration and Research Fellow, at the Nutrasweet Co.

George Kitzes (Ph.D. '44, Schuette) recalls 7 years in the pharmaceutical industry and 32 years in the federal government (V. A., Air Force, and N.I.H.). He retired in 1981 and has consulted for 10 years.

William Koerner (BS '46, Ph.D. '49, Daniels) continued his association with Monsanto, as contract consultant to the Fellow Program, after his retirement five years ago.

David Komar (Ph.D. '81, Treichel) has moved to American Cyanamid Chemical Research Division in Stamford, CT.

Mary Jo Kopecky (MS '70, Haskin) is Director of the Wastewater Management Program at the Wisconsin Dept. of Natural Resources.

Barbara Brockett Krieger (BS, '68) is currently Associate Professor of Chemical Engineering at the University of Washington.

Darwin L. Mayfield (Ph.D. '50, Adkins and Wilds) retired last summer after 34 years (including 14 years as Director of University Research) at California State University at Long Beach.

Warren Woessner (Ph.D. '71, Whitlock) is a partner and chair of the Chemical Practice Group at Merchant & Gould, a Minneapolis patent law firm.

William Link (Ph.D. '54, Schuette) retired in 1987 from Sherex Chemical Co. where he was V. P. for Research and Development.

Robert Landel (Ph.D. '54, Ferry) writes that his copy of BC was forwarded to him in Erlangen, Germany where he is spending a year as a recipient of the Humboldt-Stiftung Prize. He provided an update on his activities: he is currently a Senior Research Scientist at the Jet Propulsion Lab at Caltech. In a long career at JPL he has authored or coauthored about 90 papers and one book, received the NASA Exceptional Scientific Achievement Award for his research on polymers and the NASA Exceptional Service Medal for his contribution to the Shuttle O-ring problem, and served as a Fulbright Research Scholar in Italy, as Fellow at the Sadron Institute in France, and as a Visiting Professor in Lausanne, Switz.

Robert E. Lyle, Jr. (Ph.D. '49, McElvain) will retire as Vice President of Chemistry and Chemical Engineering of Southwest Research Institute in San Antonio, TX, after 12 years in that position. Dr. Lyle was previously at Oberlin College, the University of New Hampshire, and the University of Texas in an academic career spanning 30 years.

Ronald Mason (Ph.D. '72, Harriman) has been employed at the National Institute of Environmental Health Sciences, in Research Park, NC.

Armin de Meijere (Visiting Professor, '73) moved his research group from Hamburg to the University of Gottingen, as successor to his Ph.D. advisor, Professor Luttkie; his group of 27 coworkers is now in full operation.

Earl Melby (BS '46) is currently a manager of Materials Chemistry Research at Gen Corp, Inc. in Akron.

Jim Renga (Ph.D. '75, Reich) is now at Dow Elanco in Indianapolis.

Patricia Kreckner Moyer (Ph.D. '54, Johnson) is chairperson of the Chemistry Department at Phoenix College.

Hideo Nagashima (postdoc '85-'86, Casey) is now an assistant professor at Toyohashi University in Japan. He returned to Madison in April, 1991 to present a seminar on rhodium catalyzed hydrosilylation.



James Meyer (BS '66) was named Vice President and Director of Research at Eastman Kodak. While at Wisconsin, he had worked as an undergraduate researcher with Zimmerman.

Otto Neuhaus (BS '44) did a BS thesis with Al Wilds. After receiving a Ph.D at Michigan in '53 he went on to an academic career, first at Wayne State ('54-'66), then at South Dakota where he served as chairman for 20 years. He retired in 1988 and is now an Emeritus Professor.

Ambrose Nichols (Ph.D. '39, Walton) wrote about attending the 50th anniversary meeting of the San Diego Section of the ACS, which he had helped to found: *"I had gone to San Diego State College as an Instructor in the fall of 1939 and had been one of the group of chemists from the area who met late in 1940 to discuss the possibility of seceding from the Los Angeles Section to form a section of our own. I am sure you can imagine the situation, with busy people favoring the enterprise but being unable or unwilling to take particular responsibility. Not being as alert as I was later to become, I found myself chairing the preliminary processes... and in due course became the founding chairman... in 1941."* Attendance by the founding chairman at a local section's 50th reunion is, to say the least, unusual.

Martin Pomerantz (Postdoc 63, Berson; Visiting Professor, fall '72) is currently Professor of Chemistry at the University of Texas at Arlington.

Joe Norbeck (Postdoc '74-'76, Certain) has left his position as Manager at Ford to become the first Professor of Environmental Engineering at the University of California-Riverside.

Mark Ortman (Ph.D. '81, Larsen), after 10 years in industry, has become a research specialist-missionary for the Mormon Church. Currently he and his family are in Paris, studying French, preparing for an assignment in Chad.

Maurice Oehler (MS '61, Zimmerman), a chemistry teacher at Prairie du Chien, WI, informs us **National Mole Day** is October 23. The National Mole Day Foundation was formed to promote an awareness and enthusiasm for chemistry. Those interested should write to the Foundation at P. O. Box 373, Prairie du Chien, WI 53821.

Marshall Otis (BS '42) is an Emeritus Fellow of the American Institute of Chemistry and an Emeritus Member of the ACS. He recently received a Distinguished Service Award from Who's Who South.

Andrew Potter (Ph.D. '53, Bender) reported locating his picture in *Chemistry as Viewed from Bascom Hill* (page 616, 5th person from the left in the 5th row.)

Alan Proctor (Ph.D. '75, Bernstein) commented on the Fenske article in BC35, recalling his involvement in the purchase of the department's original IBM 7094 computer. His present work is in environmental radiation measurements.

Dean Roddick (post-doc '84, Casey) is an Assistant Professor and **Patricia Goodson** (MS '86, Casey) a lecturer-instrumentation specialist at the University of Wyoming.

Alan Rulis (Ph.D. '72, Bernstein) is Director of the Food Additives Division at the US FDA.

Marie Roth (Ph.D. '52, Johnson) wrote to make a correction in last year's entry.

Professor E. Schaumann (visiting Professor, 1980) is now Chair of Organic Chemistry at Clausthal, Germany.

James Vlazny (Ph.D. '69, Goering) is president of his own consulting company, Licensing International, Inc., in Glenview, IL, focusing on healthcare products. His background includes an M.B.A. from the U. of Chicago in 1975, 10 years with Searle and 7 with Abbott Labs as Director of the Corporate Licensing Department.

Layton Wittenberg (Ph.D. '53, Larsen) is a Senior Scientist with the Wisconsin Fusion Technology Institute on the UW Engineering campus.

Alvin Weise (BS '35, Ph.D. in Biochemistry, '40 under E. B. Hart) retired as Professor of Biochemistry at the University of Idaho in 1978.



RECOLLECTIONS

JOHN D. FERRY

The Post-War Years

WHEN I arrived on the Campus in January, 1946, the University was entering a period of excitement and stress. Aaron Ihde's monumental book of history recounts how the influx of war veterans doubled the enrollment that year, and how the overwhelming demands for student housing and classroom space were met by resourceful and innovative action throughout the community. In the Department of Chemistry, Chairman J. H. Mathews (who had been Chairman since the end of the first World War) was determined to accomplish whatever was necessary to provide for the instruction of these mature and motivated students and to ensure that new and returning faculty could launch their research programs.

Classes were scheduled on Saturdays, and laboratory periods ran until 10 p.m. To increase the number of students that could be successively accommodated through the week at a single work station, furniture in the freshman laboratories was modified and each station was supplied with a 'rabbit hutch' to store additional equipment. As for setting up research, funding from outside the University was almost non-existent, but resources were extended by ingenuity. The WARF grants administered by the Graduate School were all-important, especially for support of research assistants. (For 1946-7, the RA salary was increased from \$90 to \$100 per month.) The Department furnished supplies and some equipment; then, as now, free access to the machine shop and glass-blowing shop was enormously helpful to a new assistant professor. In the next few years, huge amounts of technical equipment became available free from military surplus, designated for educational institutions. Representatives of each research group would regularly make trips to a local warehouse and return with hundreds of useful items, especially electrical components.

Various aspects of laboratory operation, which persisted for some years after the War, were very different from today's. Standard-taper glass joints were not used in undergraduate labs and were just beginning to be available in research labs.

More specialized instruments had to be home-made, not purchased as black boxes. Transistors had not yet been invented; electronic circuits, both home-made and in commercial amplifiers and detectors, depended on vacuum tubes, whose active life was limited. Drawers and cupboards were stuffed with hundreds of spare tubes. There was, of course, no NMR, mass spectrometry, chromatography, etc. Rooms were not air-conditioned. The cheap wooden construction of the center section of the old building was poor housing for both research and teaching labs; in some of the first floor offices, there was nothing under the wooden floor but bare dirt. The building was saved from conflagration on at least one occasion by an efficient sprinkler system which, however, poured water through the wooden floors all the way from the third story to the basement. The laboratory plumbing supplied tap water from Lake Mendota, which was undrinkable and warm in the summer — algae grew in condensers and cooling jackets of distillation columns. (Some of us got city water piped in to operate thermostats at 25°C). Gallons of solvents, many of them toxic, were nonchalantly poured down the sink. There was no concern about handling of carcinogens, and benzene vapor was freely inhaled.

For data processing, the best we could muster was electrically driven, mechanical calculating machines (Marchant, Monroe). Joe Hirschfelder had a small army of 'computresses' with these clattering devices for his theoretical calculations, but experimentalists used them too. In our measurements of viscoelastic properties, with the instrument designed by Edwin Fitzgerald, each determination at a given frequency required a calculation with fifty-one arithmetic steps. Each step was recorded by hand, so any wild point in the final result could be checked for possible error or unavoidable imprecision. Over twenty years, we made about 70,000 such deter-



minations, but gradually switched from calculating machines to a sequence of computers as they evolved — saving time and labor but not maintaining the same meticulous scrutiny.

Some administrative rules in the early post-war years were more cumbersome than now. Any requisition for a non-expendable item had to be accompanied by a capital purchase form which was designed to discourage

unnecessary orders. It included the question 'What will be the effect if this item is not purchased now?' One professor delegated the paperwork to a student who filled in 'Dr. _____ will be very, very angry'. Even small items had to be submitted for bidding and this led to maddening delays. We could not have dreamed of anything as glorious as the current system of phoning a supplier under a blanket order with delivery next day.

According to State law, if more than one person in the entire University planned to attend a meeting with reimbursed expenses, the Governor's personal signature was required for approval — even if the reimbursements were to be from research grants and not State funds. Before a meeting of the American Chemical Society or American Physical Society, Dean Robert Doremus of the College of Letters and Science would draw up a list of those attending and write a letter to the Governor's Office explaining why it was important for each person to be present. Then each of us would receive a form with the Governor's autograph to attach to his expense account. With the growth of professional meetings, it was not long before the Governor delegated this task to a subordinate, and eventually the law must have been changed. The travel expense account required a receipt for each meal with the personal signature of the waitress or cashier. This got to be rather embarrassing.

But let us not be too quick to ridicule those niggling regulations. The principle that the stringent accounting rules for State money apply to all disbursement of grant and contract funds regardless of source has been a very important

protection against questionable or unethical expenditures, and Wisconsin has an excellent record.

With the closing out of wartime research contracts to universities, the Office of Naval Research began funding some basic research through contracts that were awarded on the basis of peer review, a system that was a model later for the National Science Foundation. Funding also became available from various technical units of the Army and Navy (such as arsenals) and as subcontracts from industrial firms with large government contracts. These depended more on the decisions of administrators willing to take the long-range view that basic research in appropriate areas would eventually be of benefit to military problems. Some of the contracts required monthly progress reports. I found this not so onerous as it might seem; a cover page with various project titles and code numbers, and a single page of results sufficed. The legal aspects of contracting were mysterious, involving, for example, 'negotiations' between the University and some military branch office in Chicago far removed from the technical people who understood what we were doing. It was touch and go as to whether each renewal would be

processed on time for the next payroll.

Eventually most contracts were replaced by grants. Overhead charges were very low and if my memory is correct a portion of overhead was for a brief period channeled directly to the principal investigator. There was no hint that overhead would ever become the controversial subject it is today.

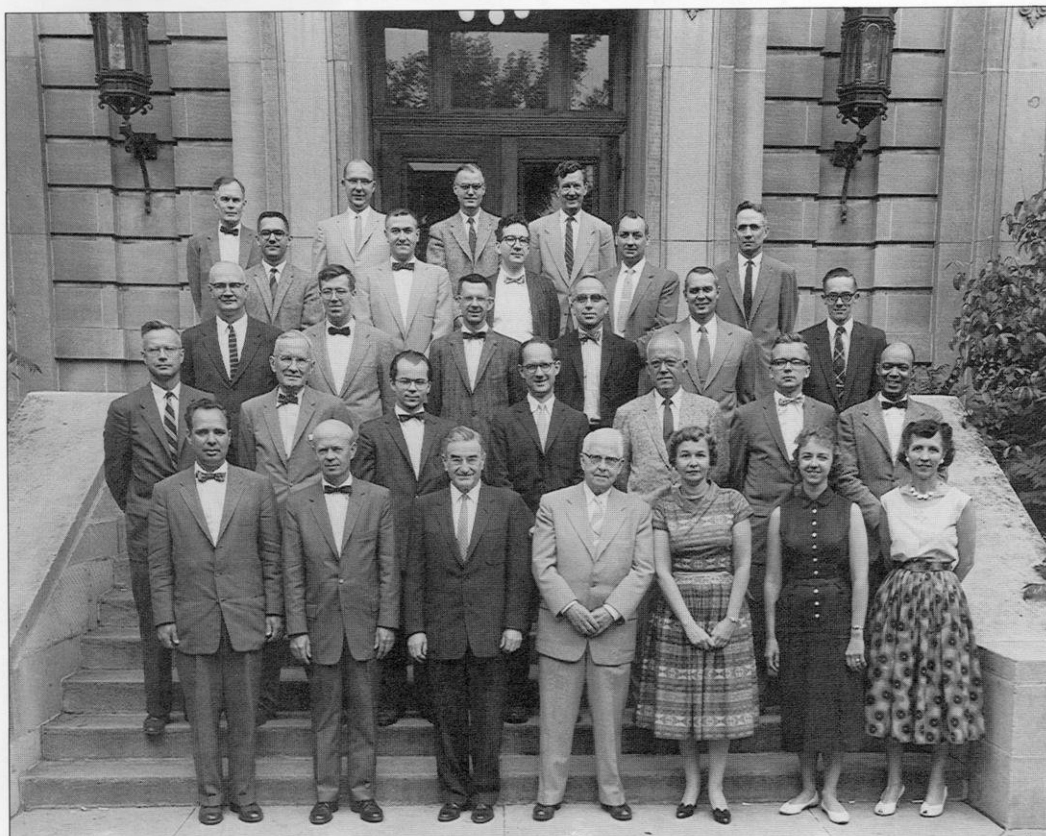
The patterns of requirements for graduate degrees have also evolved since the early postwar years. Of course, the faculty have never been satisfied for long with any system of qualifying, preliminary, and predoctoral exams, and it would be tedious to recount the cyclical changes in the rules over the decades. However, certain long-range trends are apparent. The Ph.D. minor was then much less flexible and could not be satisfied by a collection of unrelated courses; and it included a special predoctoral exam. Competence in two foreign languages was required for the Ph.D., and this continued (with some reservations about the definition of competence) until so much of the literature in Germany and France was published in English that it became hard to locate any current texts in their languages to use in examinations. The time lapse between graduate enrollment and final Ph.D. exam was blessedly shorter than today. (Of my

first seven students, three finished in two and a half years, and three in three years.) Concomitantly, theses had fewer pages. Furthermore, since carbon copies were made on onionskin paper, the bound file copy might be less than a half inch thick, in contrast to today's ponderous tomes of Xerox paper that are heavy to pick up and devour shelf space.

This brief account has given a personal view of various features, some trivial, some intrinsic, of the fabric of daily life in the Department which have changed in many respects over forty-five years. They may evoke some nostalgia in older readers but surely no desire to return to earlier times, while more recent Badger chemists may be somewhat incredulous about the practices of the past and grateful that they were born so late.



Emeritus Professor John D. Ferry retired in 1982 after over 36 years as a UW faculty member. A member of the National Academy with research interests in the rheology of polymers, John held the Farrington Daniels Professorship and served as Department Chair from 1959-1977. Almost 80 years old, he still works at the department regularly. •



1959 Faculty & Staff

UW-Madison Chemistry Department

Front row, left to right:

John Margrave, Les Holt, Farrington Daniels, J. Howard Mathews, Bette Germann, Pat Johnson, Grace Legler.

Second row:

Paul Bender, Henry Schuette, Ed Stejskal, Robert Alberty, Samuel McElvain, Larry Dahl, Odell Talliaferro.

Third row:

Aaron Ihde, Monroe Evans, Ed Larsen, Ed King, Walter Blaedel, Bob West.

Fourth row:

Dan Cornwell, Irv Shain, Ed Kosower, Harlan Goering, John Willard.

Back row:

Jack Williams, Chuck Curtiss, Al Wilds, and Harvey Sorum.

Warren Schmidt (PD '75-'77, Goering) has moved to Houston and is currently a Senior Research Chemist with Shell Development Co.

Leslie Sims (Ph.D. '55, Goering) recalls being Goering's second Ph.D. After 13 years at Ethyl Corp. he left chemistry to manage his family's business.

Thor Smith (Ph.D. '48, Ferry) retired from IBM Almaden Research Center at the end of Aug., 1991, after 22 years with IBM.

Bob Stevens (BS '80) went on to get his Ph.D. at Minnesota and is now at Air Products Inc. He returned to Wisconsin in fall 1991 as a member of the Air Products recruiting team.

Harlee Strauss (Ph.D. '79, Record) was a coeditor on a recent book, *Risk Assessment in Genetic Engineering*.

Richard Tallman (Ph.D. '60, Margrave) is retired, having worked in several R & D labs (Westinghouse, GM, and DOE, on semiconductors, metal oxidation, pyrotechnic metal combustion, corrosion, and ceramics. His work on silicon nitride joining resulted in a 1988 R & D 100 Award.

John S. Thompson (BS '50), is now retired after 33 years at FMC Corp., but still does some consulting.

Barry Trost (faculty, '65-'88) was designated as the Tamaki Professor of Humanities and Sciences at Stanford.

Vincent Webers (BS '43) relates that he retired from DuPont in 1985 after over 35 years in their Photo Products Dept. •

SNOUT-OUT '92

Remember, all alumni are welcome to attend the Chemistry Department's annual fall picnic. As always, it will be held on the second Saturday in September (Sept. 12, 1992) at Hoyt Park, (near the west side of Madison.) If you are planning on attending, please write and let us know.

Good Reviews for Departmental History



Reviews of *Chemistry, As Viewed from Bascom's Hill*, Aaron Ihde's history of the UW-Madison Chemistry Department, have appeared in five journals. Some of the comments include:

"The book's title reflects Ihde's goal, which he has admirably succeeded in attaining: To tell the story as the chemical discipline at the University of Wisconsin might be viewed from the administrative center of the university, atop the prominence named for the university's fifth president... rather than as seen from the lower levels of a professor's office... Ihde's book is packed with every conceivable fact about the department and the university — faculty and students and their temperments and personalities, courses, texts used and written, scientific apparatus and prices, research projects and interest, interdepartment squabbles, anecdotes, apocryphal legends, gossip and odd facts..."

— George B. Kaufman,
(California State University, Fresno),
C&EN, Jan. 28, 1991, p. 54-55.

"Not only does Ihde place the chemistry department within (the Wisconsin political context), he also attempts to place it within the context of overall development of science teaching and research at Wisconsin and, in so doing, provides valuable information on the history of biology, geology, physics, agriculture and engineering at the university. Finally, Ihde deals with research of key figures within the department, a feature that is missing... from all previously published departmental histories... since most chemistry departments would probably insist that research... was their most important product."

— William B. Jensen,
(University of Cincinnati),
Bulletin of the History of Science,
No. 7, p. 34-35 (1990).
(Bill Jensen is a Wisconsin
Ph.D., '82 with Larsen.)

"Wisconsin earned its reputation in large part by hiring and then supporting young and promising chemists like Louis Kahlenberg, Homer Adkins, Joseph Hirschfelder, Samuel McElwain, and many others who achieved eminence in their fields."

— John Swann
(US Food and Drug Administration),
Pharmacy and History,
33, p. 148-9 (1991).

"There is much that will interest the historian studying the development of teaching chemistry from the mid-nineteenth century. The book is fully documented and indexed. There are numerous illustrations (155)."

— M. P. Earle
(University of London),
Ambix, 38, 105-6 (1991).

"With over fifty years' experience and memories of the Chemistry Department on Bascom's Hill, Aaron Ihde is its ideal chronicler... its chemistry faculty has grown in a century from one to forty persons and (the department) is today reckoned among the top dozen chemistry facilities in the country. Ihde's archive — and oral history — based study shows how this was achieved."

— W. H. Brock
(University of Leicester),
Beckman Center News,
8 (±2) (1991).



As of this writing (December, 1991), about three-fourths of the first printing of 600 copies had been distributed.

Your copy of *Chemistry, As Viewed from Bascom's Hill* by Aaron Ihde, is available at a cost of \$25, and can be obtained by writing to:

Department of Chemistry,
c/o Ms. Jan Froding,
Department Secretary,
University of Wisconsin,
Madison, WI 53706.

This Badger Chemist
breathes the glory
of Wisconsin today,
a Wisconsin inspired
by the vision of her
Past and secure in
the courageous
flame of her Destiny



This Bodger Cooperist
breathes the glory
of Wisconsin today
A Wisconsin inspired
by the vision of her
Past and secure in
the courageous
flame of her destiny



GRAPHICS BUREAU