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School of Chemical Sciences
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Hanratty Elected to National Academy of Sciences

During his 45 years at the University of Illinois, Professor Thomas J. Hanratty has become an authority on turbulence and two-phase flow. His accomplishments and contributions were recognized this year with his election to the National Academy of Science. Hanratty pioneered the development of electrochemical techniques to study flow close to a wall and mass transfer to a wall. These techniques have opened up new possibilities in experimental fluid dynamics. He has used these techniques, as well as optical methods and supercomputer experiments to study the structure of turbulence and how turbulence can be modified.


Thomas Hanratty

His work in heat and mass transfer have involved studies of the influence of natural convection on flow fields and the development of new theoretical frameworks to examine turbulent transfer of heat and mass. Hanratty has also been a leader in developing methods to describe the behavior of multiphase systems in terms of small scale interactions.

His work has resulted in numerous honors and awards. From the American Institute of Chemical Engineers, he received the Colburn Award in '57, the William H. Walker award in '64, and the Professional Progress Award in '67. From the American Society of Engineering Education he received the Curtis McGraw award in '63 and the Senior Research Award in '79. In '86 he received the Ernest W. Thiele Award for Chemical Engineering Practice, and in 1998 Hanratty was awarded the first International Multiphase Flow award.

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Rauchfuss has been Appointed Director of the School of Chemical Sciences

Professor Thomas Rauchfuss is optimistic about the future of the School and has many plans to accomplish his goals. He regards the School as "something very special," more than a department and not quite a college. It has the advantage of the breadth of two very excellent departments that are different enough to be interesting and similar enough to cooperate closely.


Thomas Rauchfuss

He sees the main function of the School as a facilitator to help the departments to achieve their goals, to craft collaborative projects both within the School and beyond, and to achieve an effective development plan to support broad enterprises in research and education. Excellence is expensive and Rauchfuss states that one of his main jobs is to develop opportunities to maintain our excellent reputation.

He points out that the School will not be an extra layer of bureaucracy but a "part of the team" that helps the departments to think big, develop new ideas, and to get things done that would be difficult as a stand alone department. He expects that the School will continue to grow as a gathering place where new ideas are generated. He plans to stimulate its outreach programs on a national and international scale. He has studied extensively abroad and is an inveterate traveler who appreciates the advantages of cultural mixing.

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Hanratty received a B.Ch.E. degree in 1947 from Villanova University. Before beginning his graduate studies, Hanratty worked for the Fischer & Porter Company as a fluid dynamics specialist. He then joined the Battelle Memorial Institute where he developed methods for making rocket fuels. In 1950 he received a Master's degree from Ohio State University. He attended Princeton University where he received a Ph.D. in 1953. Since then, he has been a professor at the U. of I. He was the first recipient of the Westwater Professorship and the first chemical engineer to be appointed to a Shell Distinguished Professorship.

Hanratty is recognized as a pioneer in computational approaches to understanding turbulence.

His alma mater, Villanova University, presented him an honorary doctorate in '79. Ohio State University presented him the Distinguished Engineering Alumnus Award in '84 and the Lamme Medal in 1997. He received an honorary doctorate degree from the Polytechnic Institute of Toulouse in November of this year.

Professor Thomas Hanratty joins Professors Harry Drickamer and William Schowalter, Dean of the College of Engineering, as a member of the National Academy of Engineering, the American Academy of Arts and Sciences and the National Academy of Science.

To reach your editor...

You can reach our office by e-mail at **scsnews@scs.uiuc.edu** and by fax at 217-333-3120. Please continue to send your news and also include comments on the newsletter, alumni and development programs and any questions you may have on any of the above. We enjoy hearing from you.

Plans are Under Way for a 3-D Visualization/Computation Facility

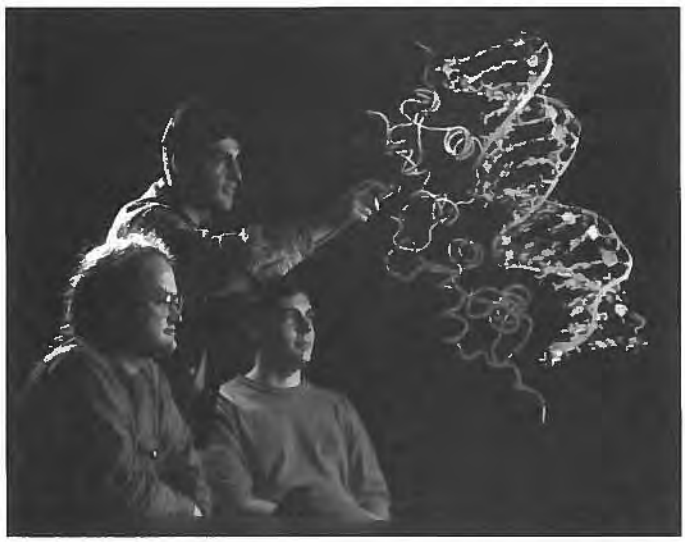
To add substance to our new programs in chemical biology and materials science, the School is designing a new facility which should soon become a reality. Professor Zan Schulten, who is already teaching a course in chemical biology, is an enthusiastic supporter. In her opinion, "The time has come to provide our students with a curriculum that addresses problems in Chemical Biology and Materials Science, certainly the fastest growing fields in the Chemical Sciences."

The laboratory will instruct a wide range of undergraduate as well as graduate students. We estimate that about 300 students will use the laboratory each semester. The facility will enable the students to use powerful computational tools in their everyday research. Not long ago, computational tools were primarily in the domain of the theorist. Today they are a practical part of any synthetic chemist's repertoire. At a time when scientists are increasingly concerned with specificity and chemical wastes, it behooves us to explore our chemical possibilities computationally. Researchers need to look and feel how large molecules such as proteins, nucleic acids, metal catalysts, and zeolites interact with substrates. These tools are essential to modern research and skills in this area are increasingly expected of our students.

Zan Schulten

One of the most innovative aspects of the planned facility is a "haptic arm," basically a mouse whose cursor movement reflects the nature of molecular interactions, be they attractive or repulsive. In this way, students and researchers will be able to explore the binding of enzyme inhibitors and the intramolecular interactions that drive protein folding.

Despite the costs of the project, the School is convinced that a 3D Visualization/Computational laboratory will be necessary in order to integrate teaching and research in both the biomolecular and materials chemistry programs. A Visualization Fund has been set up for contributions to the project and can be found on the page in the newsletter listing the major funds of the School.



Picture is provided by Klaus Schulten's theoretical biophysics group and represents how students could carry out an interactive modelling session in which they probe the interaction of the estrogen receptor with DNA.

An Administrative Rearrangement in the School of Chemical Sciences

by Thomas B. Rauchfuss, Director and Stephan G. Sligar, Former Director

If some of you have heard rumors of "rearrangements," you may have heard correctly. The Department of Biochemistry will move into a newly formed School of Molecular and Cellular Biology (MCB), under the umbrella of the Life Sciences. The shift reflects the current strong overlap of the teaching and research missions of Biochemistry with departments that focus on cellular issues, as the name of the new school implies. We in the School of Chemical Sciences look forward to continued collaboration with our friends and colleagues in Biochemistry.

Under the revised administrative structure, relations between SCS and MCB will be close. For example, Biochemistry faculty will continue to use SCS's world famous service facilities and its library. The new SCS and MCB will also be linked through faculty who will have affiliations in both schools, namely, Professors Gennis, Gert, and Sligar who carry joint appointments in Biochemistry and Chemistry, and Chemical Science Professors Leckband, Yi Lu, Kelleher and Van der Donk who have become departmental affiliates in Biochemistry.

We anticipate that biologically inspired research and teaching will thrive in the new SCS as it continues its tradition of pursuing "interesting" chemical problems wherever they may lead. (See articles on Professors Kelleher, p.7, and Leckband, p. 8.)

The College of Liberal Arts and Sciences (LAS) at the UIUC remains one of the largest colleges in the nation. It is composed of 51 departments, ranging from Archaeology to Zoology. The biological and chemical sciences are unique within LAS in that they are organized into "schools." The school structure explicitly recognizes the distinct culture of the sciences (i.e. we're very expensive) and encourages the development and sharing of research facilities. The changing structure of the College and of the Schools reflects the ongoing scientific evolution of Biochemistry, the Chemical Sciences, and the Life Sciences.

The new SCS now consists of two departments, Chemical Engineering and Chemistry, together with their service facilities, and an administrative structure, which is comparable to that of University of California at Berkeley and the California Institute of Technology. The new SCS will continue to grow both in size and in scope. A few relevant facts are the following:

- The "reorganized" school has 51 active faculty who have primary appointments within the School.
- Currently, the School has 352 graduate students.
- The School has 73 postdoctoral researchers, and awards approximately 60 Ph.D. degrees and about 27 M.S. degrees annually.
- It has about 728 Chemistry or Chemical Engineering majors.
- The School is home to 54 nonacademic and academic professional staff.
- The activities of the School are housed in approximately 260,000 square feet of space in four chemistry buildings, the Beckman Institute and the Materials Research Laboratory.

Rauchfuss, continued from p. 1

Rauchfuss is truly excited by the range of capabilities of the School which has been very successful in recruiting outstanding young faculty and graduate students. These precious resources will help the departments nurture. The students need to experience the esprit de corps, which has always been one of the hallmarks of the School. Our faculty appreciates the strengths of the School and is cognizant of how it will facilitate their potential careers.

Professor Rauchfuss has been at the U. of I. since 1978, after completing a Research Fellowship at the Australian National University. He earned his undergraduate degree from the University of Puget Sound in 1971 and his Ph.D. from Washington State University in 1975. He has been a guest professor at the University of Auckland, the University of Strasbourg and the Technical University of Karlsruhe.

His research interests follow two directions. He makes organometallic "cages" and "clusters," facetiously described as "honey traps," to hold small molecules and atoms. His group studies the rules for using these molecular tinker toys to determine what can be put into the cages, and how molecules move into and out of the cages.

He has also had a long term interest in the chemistry of fossil fuel cleaning. Rauchfuss is quick to point out that the hydrodesulfurization of petroleum feedstocks is one of the single largest scale applications of catalysis on the planet. His objective is to find more efficient catalysts to break the carbon-sultur bonds so that the sultur and nitrogen can be removed from fossil fuels before they are combusted or processed further. This is an example of "front end" environmental chemistry aimed at obviating a problem rather than cleaning up afrer the poliution has occurred.

Dr. Rauchfuss has received an A.P. Sloan Foundation Fellowship; he has been elected a Camille and Henry Dreyfus Teacher Scholar and a University of Illinois Scholar. He has been a Fellow of the J.S. Guggenheim Foundation, a Senior Scientist of the Alexander von Humboldt Foundation, and has received a Fellowship from the Japan Society for the Promotion of Science.

In Memory of James Cullen Martin 1928–1999

by Professor Anthony (Bo) Arduengo

The world has lost a luminary figure from its scientific community. On April 20, 1999 Professor James Cullen Martin died after a long struggle with a debilitating illness.

James Cullen Martin (J.C. to his many friends) was born in Dover, Tennessee on January 14, 1928. He served his country after the end of WWII as a cultural liaison in the Pacific. This experience was the beginning of J.C.'s life-long appreciation of other cultures. This interest would later be realized through J.C.'s frequent travels as a world-class scientist.

J.C. Martin received his Bachelor's and Master's degrees from Vanderbilt University in '51 and '52. He took his Ph.D. at Harvard and was awarded a degree in 1956 for his work with Professor P.D. Bartlett on solvolysis and carbonium ion stabilities. Immediately thereafter, he joined the faculty of the University of Illinois at Urbana-Champaign. His initial studies at Illinois included radical stabilities and decomposition mechanisms. This led to the discovery of neighboring group participation in peroxide decomposition reactions.

Among the neighboring groups studied in this research, various main group heteroatoms like sulfur and phosphorus began to appear. The role of such heteroatoms in neighboring group assisted decompositions marked the beginning of a new focus for his research interests.

J.C. Martin blended the traditions and experimental approaches of organic chemistry with the new chemistry of the main group elements. He used principles from his organic background to design ligands that would facilitate the construction of molecules that were otherwise difficult to make or stabilize. Most famous of the ligands is that derived from hexafluorocumyl alcohol (most commonly referred to as the Martin ligand). Through the application of the Martin ligand and other related research tools, J.C. invented or discovered a large number of new structural motifs.

J.C. Martin's understanding of chemical bonding and his skill at ligand design gave rise to very important first observations of hypervalent carbon and boron species. His wide ranging studies of organo-nonmetallic chemistry led to many other significant "firsts". Synthetic reagents developed by the Martin group included the Martin Sulfurane (dehydrating agent) and the Dess-Martin Periodinane (oxidizing agent). These find many applications in modern synthetic chemistry.

In 1985 J.C. Martin returned to Vanderbilt University as a Distinguished Professor of Chemistry. At Vanderbilt he provided evidence for sigma-aromaticity among the iodine atoms of the hexaiodobenzene dication. He also studied important new hypervalent Si-H silanes. J.C. Martin left this position in 1992 because of illness.

While still at Illinois, J.C. was active in the American Chemical Society. He served as chairman on a number of different

J.C. Martin

by Nelson Leonard

When I think of J.C. Martin, I think of a rational, warm human being who possessed more skills than he had the opportunity of using in his too-short lifetime. I returned to Urbana from a brief trip abroad in 1955 to find my colleagues in organic chemistry enthusiastic about hiring J.C., who had given a seminar in my absence. We moved quickly with an offer once I learned that he was a good singer in addition to being a most promising chemist! He established a flourishing research program very quickly and he taught his courses with enthusiasm. He and his wife, June, brought a new dimension to the social life of the chemistry staff with generous hospitality in their new house on Champaign's only lake.

We had started to plan a new building about the time of J.C.'s arrival on campus. There was a fact-gathering and then a fund-raising period that I could supervise for the organic chemistry portion, but when the process shifted into the third phase, J.C. became part of the team that brought into place the model units designed by Earl Walls, consulting architect. J.C. and I lived with the blueprints and he tested all of the materials that were to go into the construction. He made practically daily inspections during the actual construction process, with the result that the organic chemistry section of the Roger Adams Laboratory was almost error-free.

J.C. shouldered many responsibilities in the Department of Chemistry and in the School of Chemical Sciences. His sound judgment provided the best advice on many occasions. He did not often retreat from an opinion or a position he had expressed, but that was because his idea was obviously better than others that had been contributed.

publication committees and was involved (often as chairman) in search committees for the selection of journal editors. As chairman of the Organic Division of the American Chemical Society, J.C. led an effort to enlist the interest and talents of younger chemists in the activities of the organization. He worked on various review and oversight teams for the National Science Foundation. He also organized national and international conferences in organic chemistry and in the chemistry of the main group elements.

J.C. was recognized for his accomplishments by an Alfred P. Sloan Fellowship, a John S. Guggenheim Fellowship, and a Senior Research Award from the Alexander von Humboldt Foundation. He was the 1979 Buck-Whitney Medalist and was a Fellow of the Japan Society for the Promotion of Science.

J.C. never lost sight of the fact that he was first and foremost a teacher. A number of his former students and co-workers came to his memorial service, some from as far away as Japan. The tributes demonstrated that J.C. had a profoundly positive effect on his students. He taught them not only chemistry and the scientific method but also communicated the joy he derived from his scientific studies. His example demonstrated the importance of integrity of character.

As a tribute to their father, J.C.'s sons and former colleagues, in conjunction with the University of Illinois, have established the J.C. Martin Memorial Scholarship Fund. Donations to the fund are being received at

J.C. Martin Memorial Fund
c/o University of Illinois Foundation
Attn: Louis Rice
1305 W. Green Street
Urbana, IL 61801

J.C. is survived by two sisters, five sons, five grandchildren, and by scores of academic progeny.

Snyder Scholars Thank Their Donors

The Snyder fund was established by the students and friends of Professor Harold Snyder, one of the important organic chemists of our Chemistry Department along with Professors Roger Adams and Carl Marvel. The purpose of the fund has been to give undergraduate students of high potential and interest in organic chemistry an opportunity to work full time in a faculty research laboratory, usually during the summer semester. At the end of their term in the laboratory, the students write a technical description of the work they have done. In addition, they usually take part in an informal discussion with the editor of this newsletter where they talk about the program, what it has meant in their lives and how they expect it to impact their future.

This year seven Snyder Scholars met at the end of their laboratory work and asked the School to thank the donors for what had been a wonderful experience. All were undergraduate students from here or elsewhere. The details of their experiences differed but they all agreed that the opportunity was much more exciting than they had ever anticipated. They felt that they had received personal attention from faculty who really cared about their research experience.

One of the students, speaking for the group, said that the Snyder program gave them a head start for when they start graduate school. Working in the lab gave them an idea of what graduate studies entailed. Another was convinced that the experience will put them "A step ahead of other, incoming students." They had become accustomed to the requirements of working in a laboratory, and had become proficient in the use of modern instrumentation. As one said, "When the new graduate students start their studies, they find it an overwhelming experience because they have to learn so much in a very short time in order to make their way in the new environment. With the Snyder experience, they can just concentrate on their studies."

Several were very impressed with the University of Illinois and its chemistry program and plan to apply here for graduate work. A couple of the students have or will publish a paper based on their work at the University of Illinois under the auspices of the Snyder program. They doubted that they would have had the same opportunity in another environment. They considered the University of Illinois "an amazing place" and plan to persuade their friends to apply for the Snyder program when they return to their respective schools.

The students appreciate the support given by the donors to the Snyder Fund and hope that prior and new donors will continue their generous support of this excellent program.

"the U. of I. is an amazing place"

"the Snyder program gave us a true head start for graduate school"

From left, Matthew Christy, Kristi Dimitriou, Michael Ober, Joseph Dupont, Joshua Schmidt, Michael Choi, Kennth Mamoh

Grunberg-Manago Receives Honorary Ph.D.

At the May, '99 commencement, Dr. Marianne Grunberg-Manago received an honorary Ph.D. degree from the University of Illinois in recognition of her contributions to the fields of Biochemistry and Molecular Biology.

Early in her career she discovered polynucleotide phosphorylase, the first enzyme which could catalyze the synthesis of nucleic acids from mononucleotides. The enzyme was used to synthesize ribonucleic acids, of defined composition and sequence, which were subsequently used to elucidate the genetic code. Dr. Grunberg-Manago conducted studies of the genetic code and of the mechanism of translation of the code from RNA to proteins. She focused on the role of initiation factors and on the dynamic aspect of ribosome function in protein synthesis.

Dr. Grunberg-Manago opened a new field of investigation into the mechanisms associated with the initiation of protein synthesis. Most recently she has used recombinant DNA techniques to study the organization of genes and the regulation of their expression for the synthesis of the initiation factors for the threonyl and phenylalanyl-tRNA synthetases.

Dr. Marianne Grunberg-Manago is the central figure in the photo. On her right are President Stukel and Jeff Gindorf, Chair of the U. of I. Board of Trustees. On her left are Dean Jesse Delia and Chancellor Michael Aiken.

We are proud that, early in her career, Dr. Grunberg-Manago was a postdoctoral fellow in Professor I.C. Gunsalus' laboratory at the University of Illinois. Her distinguished career has been marked by many "firsts." She was the first woman to be elected to the French Academy of Sciences. In '95 she was elected and served a term as President of the French Academy. She has been elected a foreign member of the United States National Academy of Sciences, the Russian Academy of Science, the Ukrainian Academy of Science, and she is a member of the American Philosophical Society.

Burckhalter Receives U. of I. Alumni Award

At commencement in May, 1999, Professor Joseph Burckhalter received the Alumni Achievement Award for his ground-breaking research in the biological sciences. In making the award, Loren R. Taylor, Alumni Association President and CEO said, "This award only goes to men and women whose work has made a significant contribution to society. Dr. Burckhalter's innovative work to improve human health has clearly made a positive difference."

Dr. Burckhalter's greatest contribution was his leadership of the team that invented fluorescin isothiocyanate (FITC), the first commercially available fluorescent antibody labeling agent that has become widely used for rapid, accurate and efficient diagnosis of infectious and cancerous diseases. It was used in the discovery of the HIV virus, which causes AIDS. The antibody provided the first reliable test for syphilis, and was used in the diagnosis of Legionnaires and "mad cow" diseases. He also synthesized Camoquin, the first single-dose cure for malaria. His important inventions that led to the development of 12 new medicines are based on work he began at the University of Illinois as a graduate student.

Joseph Burckhalter

He describes himself as a "local boy," having lived in Vermillion County. As a youngster he moved to South Carolina and received his bachelor's degree in chemistry from the University of South Carolina. In 1938, he received his MS degree in chemistry from the University of Illinois. under the supervision of Professors Fuson and Marvel; he earned a Ph.D. in medicinal chemistry from the University of Michigan. During his career, he established medicinal chemistry programs at the University of Kansas and at the University of Michigan.

Currently he is research professor at the Florida Institute of Technology in Melbourne, Florida; and holds the title of Professor Emeritus of Medicinal Chemistry at the University of Michigan. In recognition of his important contributions, he received the American Innovator Award in 1995 and has been inducted into the National Inventors Hall of Fame.

Kelleher Receives Warm Welcome

As Neil Kelleher describes it, he literally got a "shot gun start" when he joined the analytic division of the chemistry department. He is a bioanalytical chemist who uses new ionization techniques, such an Electrospray Ionization to transfer large molecules, such as proteins, into the gas phase for subsequent high-resolution measurement of molecular weight by Fourier Transform Mass Spectroscopy (FTMS).

Kelleher has a multipronged research plan. At the interface with biochemistry, his objective is to elucidate the function and mechanism of enzymes whose action result in a shift in mass of themselves or their protein substrates. Such enzymes are

found in the biosynthetic pathways of natural products that are clinically used antibiotic and antitumor compounds. With his instrumentation, he can measure minute changes in protein masses, like the addition of one proton (1 Da) to a 100,000 Da protein. A theme of Kelleher's past research has been to translate analytical advance into biological insight.

At the interface of chemistry with biology, Kelleher plans to analyze the complete protein composition of the smallest self-replicating organism, *Mycoplasma pneumoniae* (a bacterium) which causes "walking pneumonia." Its genome has been entirely sequenced, predicting 667 proteins. Kelleher wants to correlate the predicted proteins with those actually present. Such exhaustive analysis at the protein level for an entire organism has never been accomplished, but Kelleher is well positioned to achieve this feat (Figure 1). Structural knowledge of the proteins should uncover new targets for drug development as well as fundamental insight into microbial biology.

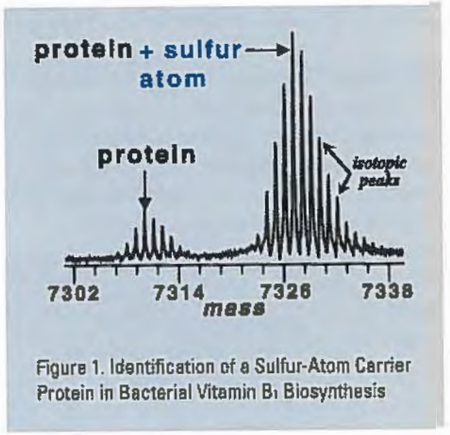


Figure 1. Identification of a Sulfur-Atom Carrier Protein in Bacterial Vitamin B_1 Biosynthesis

Kelleher expects to target natural systems where high performance mass spectrometry can spearhead biological research, such as those producing vancomycin, an antibiotic of last resort, and the immunosuppressant cyclosporin A. He hopes to find a new system for study to find an unknown covalent modification to a single protein to add a Kelleher covalent modification to the 260 that are presently known. FTMS is necessary to scan efficiently for such novel covalent modifications. Once found, the enzyme that forms the new modification will be sought and evaluated as a possible drug target. In this day of "superbug" invasions, the discovery of new covalent modifications can lead to new and important drugs that can join in the battle to save lives of those who are resistant to existing antibiotics.

Such exhaustive analysis at the protein level for an entire organism has never been accomplished, but Kelleher is well positioned to achieve this feat.

Kelleher is well aware of the high bar he has set for his program at UIUC. Emboldened by his interdisciplinary training and expertise using the world's highest performance mass spectrometer, he is convinced that important findings are in his near future. According to Kelleher, "These are doable, fundable, publishable projects that will be of great scientific and practical value."

Although he has been here less than two months, he has seen enough to be delighted with his choice of the University of Illinois. He finds his colleagues congenial and the infrastructure second to none. The range of instrumentation at the University of Illinois is remarkable and, even more so, the help that is available to make the tools user friendly to himself and his students. This aspect of Illinois was critical to lure Kelleher because, as an interdisciplinarian, he will undoubtedly require instrumentation beyond his current skill set.

He has equally ambitious plans to become an outstanding teacher and is willing to invest his time and resources to become effective and energetic in the classroom, advising undergraduates, and providing research for undergraduate students. He also plans to "translate (his) enthusiasm for chemistry into colorful explanations and interest-grabbing demos in (his) lectures."

Neil Kelleher came to the University of Illinois from his postdoctoral position at the Harvard Medical School. He earned his Ph.D. at Cornell (chemistry) in a program that combined instruction in enzymology and in mass spectroscopy. Prior to his work at Cornell, he spent a year as a Fullbright Scholar at the University of Konstanz in Germany and earned his undergraduate degree at Pacific Lutheran University in Tacoma, Washington.

Among his more noted awards is an NIH Postdoctoral Fellowship at Harvard University and a Graduate Fellowship awarded by the ACS Division of Analytical Chemistry. Neil Kelleher is already on a fast track and expects to maintain this pace.

Leckband Studies Biological Molecules with Surface Force Apparatus

Professor Leckband was one of the first to use a Surface Force Apparatus to measure the forces that determine how biological molecules interact. Now she is breaking new ground in understanding how the structure and disposition of proteins and biomedical polymers determine the force fields that control their interactions with other molecules and their properties.

Other approaches to measure the forces needed to break intermolecular bonds. Such measurements are limited because they cannot measure both the range and magnitudes of the attractive and repulsive forces that control intermolecular interactions. These forces can be measured, however, with the surface force apparatus. Professor Leckband's group is one of several that use the surface force apparatus, but hers is the only one dedicated to investigations of biological materials and of proteins.

One of her current projects is the study of cadherin, a protein whose function is to bind cells in soft tissues together. It also plays a major role in embryonic development. Professor Leckband's work is aimed at determining how tightly cadherin proteins bind to each other. Cadherin is essentially the glue between the cells, and the strength of the bonds determines, in part, the structural integrity of tissues and organs. To understand how this molecular glue functions, her group is investigating the mechanisms by which these large proteins adhere and break apart when they are pulled. Her research showed that cadherin binds to identical cadherin proteins on adjacent cells in unexpected alignments.

The majority of proteins that have been studied by direct force measurements bind complementary molecules at a single, unique site on the protein surface. Using direct force measurements, Leckband and her students have shown that cadherin apparently binds at multiple sites. The strongest bonds form when the proteins are fully aligned (Figure a). However, if the first bond breaks, the proteins can slip to a second binding configuration (Figure b). Her studies suggest that these sequential binding events may act as a catch to prevent the "molecular glue" from failing, and may therefore play an important role in stabilizing these important protein-protein bonds.

Professor Leckband is now studying other cell adhesion proteins important for neurons and cells involved in the immune response. Because these proteins function in vital tissues and play an important role in the development of embryos, Professor Leckband hopes to obtain a molecular level understanding of how these proteins function in normal tissues. Such studies are important for determining the molecular basis of disease, and for identifying ways of correcting abnormal protein function.

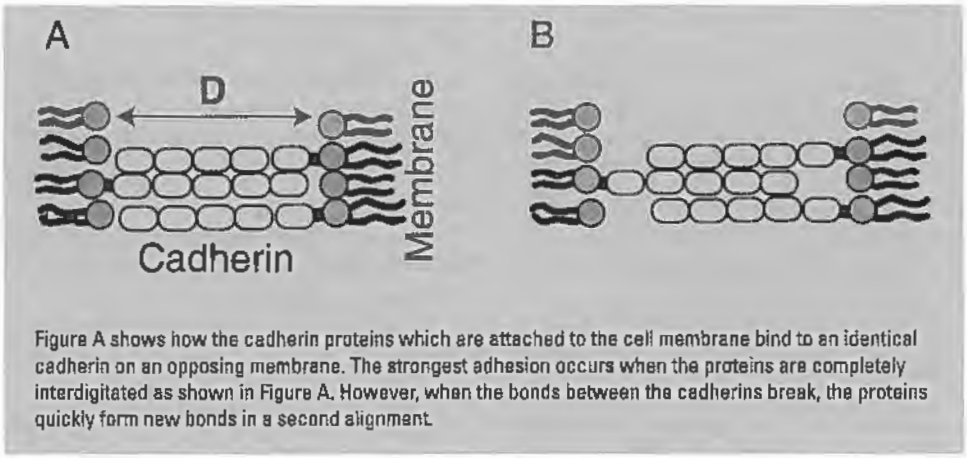


Figure A shows how the cadherin proteins which are attached to the cell membrane bind to an identical cadherin on an opposing membrane. The strongest adhesion occurs when the proteins are completely interdigitated as shown in Figure A. However, when the bonds between the cadherins break, the proteins quickly form new bonds in a second alignment.

In addition to studying the forces that control protein function, she is also interested in the properties of medical polymers. Using direct force measurements to study synthetic polymers used in medical applications, she hopes to identify the particular properties that are responsible for their compatibility with biological fluids or with tissues. The challenge is to design materials that are either invisible to the body or integrated into the tissue structure.

Determination of the relationships between the chemical composition of different polymers and their interactions with proteins and biological materials helps researchers to identify the key properties responsible for how well these synthetic materials interface with the body. By studying a medically important synthetic polymer, Leckband's group hopes to identify the physical chemical basis of its unusual success in many applications. The literature contains different models intended to account for the success of this polymer as a medical material. Using direct force measurements, Leckband has been able to test these models directly. Importantly, her group has identified exceptions to the rules and is now working to map the conditions under which deviations from ideal behavior occur. She hopes that these results will help to identify criteria that can be used to design polymer coatings that render medical implants more compatible with the body.

Leckband's is the only surface force group dedicated to investigations of biological materials and of proteins

This spring, Leckband was not only promoted with tenure, but she was also awarded the College's prestigious Helen Petit Professorship. This endowed chair is awarded each year by the College of Liberal Arts and Sciences to two junior faculty at the time of their promotion to associate professor. It is given on the basis of demonstrated excellence in research and

teaching. She was also selected to become a Fellow in the Center for Advanced Study in the Spring 2000 semester. The selection of Fellows to serve one-semester appointments in the Center is based on the promise of scholarly and professional achievement. Last year she received an award from the Xerox Foundation for outstanding research.

She is looking forward to working at the Sloan Kettering Memorial Cancer Institute in New York next Spring, during her appointment as a fellow at the Center for Advanced Study. She plans to genetically manipulate different adhesion proteins. By studying the function of these proteins by direct force measurements, Leckband hopes to identify the molecular mechanisms that underlie certain developmental abnormalities and human disease caused by defects in cell-cell adhesion.

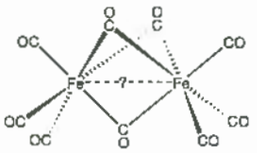
Leckband received her Ph.D. in Chemistry from Comell in '88, followed by two postdoctoral positions, one in Chemical Engineering at MIT and another in Chemical Engineering at the University of California at Santa Barbara. Before coming to the U. of I. in '95, she was a faculty member for two years at the State University of New York at Buffalo. She finds the atmosphere at the U. of I. congenial, and an ideal environment for interdisciplinary research.

Review of the Third Edition of
A Laboratory Manual
Synthesis and Technique in Inorganic Chemistry

By Gregory Girolami, Thomas B. Rauchfuss, and Robert J. Angelici

According to a colleague, this is a thoughtful, profound book on the basics of chemistry, masquerading as a mere laboratory manual. It asks fundamental questions, where other books satisfy the student with quoting rules and references.

For instance, in a discussion of Experiment 12, "The Paramagnetic Complex Mn(acac)3," the authors state, "Accordingly, one might expect that each Fe atom would be paramagnetic with one unpaired electron. Instead, the compound is diamagnetic and a reasonable bonding proposal requires that there is an electron-pair, covalent bond between the Fe atoms (the dotted line in the drawing). The relatively short Fe-Fe distance in the compound (2.52 C) *supports this suggestion.* (p. 119)" This statement is accompanied by a simple cartoon (p. 118) showing a question mark between the Fe atoms. The



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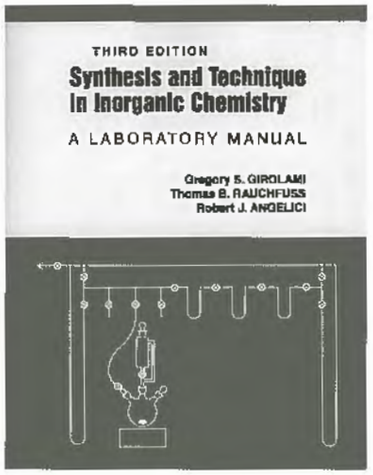

objective is to stimulate the reader to consider the issue of the bond an open question rather than a closed rule.

It is a book that questions many common assumptions and is rich in insights that are of value to professors as well as students. The three authors have written an unpretentious book that opens the field of chemistry to the thinking chemist who is willing to question the perceived wisdom in the field.

Pek Chong Wins Roche Award

The Roche award for Excellence in Organic Chemistry is given by the Department of of Preclinical Research and Development of Hoffman-LaRoche Inc. The University of Illinois was chosen one of the seven outstanding chemistry departments in the country that are given the opportunity to name a winner among their fourth year organic chemistry graduate students.

Pek Chong

Pek Chong, who works with Professor Peter Petillo, received the award this year for outstanding achievement in organic chemistry. Her current research project involves developing a synthetic methodology for the construction of multivalent carbohydrate architectures. These structures present multiple copies of a saccharide on the periphery and incorporate saccharides as key branching components within the polymer. Chong and Petillo expect these polysaccharide mimics to have interesting material properties. Furthermore, these systems could mimic cell surface carbohydrates that rely on cluster effects to bind proteins.

Pek Chong came to this country from Malaysia eight years ago. She attended secondary school in Singapore and received her undergraduate degree from Harvey Mudd College in Claremont, California. When she completes her Ph.D. degree she hopes to find a research position in industry. In the near future, she is looking forward to a trip to Hoffman-LaRoche where each of the seven winners will have an opportunity to meet Roche scientists and to present his or her research project.

Art in Public Places

student projects in the summer of '99

West side of Quad

North patio of Foellinger Auditorium

Noyes Lab

Excellence Needs Your Help

Help us to maintain and expand our programs by supporting Chemical Science Funds. We have listed below the most active funds in the three departments. If you would like to contribute to a fund not listed, please enter the name beside OTHER.

Matching gifts from your company multiply your dollars. If your company has a matching gift plan, please include a form from your company along with your contribution.

Remember — your contributions make a GREAT difference!

Mark the appropriate box. If sending a check, please make it out to UIF/(fund name). A preaddressed envelope is enclosed for your convenience.

- ☐ **School Facilities Fund** (35791/75930): Upgrades infrastructure such as the visualization facility library, NMR, microanalytical, and mass spectrometry labs.
- ☐ **Creating the Future in Chemical Engineering** (30816): Funds new directions in Chemical Engineering.
- ☐ **Chemical Engineering Instructional Laboratories** (30821): Develops and maintains state of the art technologies and education in undergraduate instructional laboratories.
- ☐ **Chemistry Development Annual Fund** (34856): Provides start-up funds for new faculty, seed money for research initiatives, and other vital needs.
- ☐ **Roger Adams Fund** (45020/75100): Funds teaching awards, relocation allowances, scholarships and fellowships.
- ☐ **Partnership for Chemistry** (35790/75750): Builds endowment support for new programs, e.g. the materials chemistry program.
- ☐ **Carter Fellowship Fund** (45709/1599): Supports the first named fellowship in Biochemistry.
- ☐ **Other** _____

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Your news (please include newspaper clippings, photos, extra sheets, etc.) _____

Alumni News

'30s

George E. Symons, B.S. 28, M.S. '30 and Ph.D. in '32 (Chemistry with Buswell), is a retired consultant in environmental chemistry. At the age of 99 he has just moved from an apartment in Palm Beach to "a posh retirement community" in the same city.

'40s

R. Byron Bird, B.S. '47 (Chemical Engineering), was given an Honorary Dr. of Science degree from Texas A & M University in May, '99.

Clarke L Coldren, M.S. '50 and Ph.D. '54 (Chemical Engineering with Johnstone), was awarded en Outstending Engineering Alumni Award by Penn Stete's College of Engineering. Coldren earned his B.S. in Chemical Engineering from Penn State in '48. He devoted his entire career to the Shell Oil Company. He was manager of Shell's Resins Business from '72-'78 end stimulated the growth of the division from $30 M. annual revenues to more than $600 M today. As manager of the compeny's Technical Development Laboretory from '59-'64 he created a pipeline research laboratory that is now the world's preeminent group in underwater pipeline technology. Under his supervision, Shell began automation of product delivery systems which extends from the refinery to the gas pump.

Arthur W. Anderson, earned a Ph.D. in '41 in Chemistry under the supervision of Roger Adams. He describes his career as 41 years at DuPont research. He served 35 years in management of research and 17 years, after his retirement in 1982, as technical consultant to DuPont. He was awarded the Pedersen and Lavoisier Awerds for inventions and developments which have resulted in several new businesses for DuPont.

'50s

David W. Carley, Ph.D. 52 (Chemistry with G.L. Clark), has retired from teaching at Ripon College. He is enjoying e small furniture repair and refinishing business in addition to cruise travel. He has fond memories of golf outings in Michigan with Herb Carter and visits with Dr. Beilar at his Colorado mountain retreat.

Busch elected president of the ACS

Daryl Busch, (Ph.D. '54 with Bailar), was named President Elect of the ACS in 1999. He will be president in 2000 and former president the year following. During his three-year term, he will also serve on the Board of Directors from 1999 to 2001.

Daryl Busch

Busch is Roy A. Roberts Distinguished Professor of Chemistry at the University of Kansas, in Lawrence, Kansas. Before coming to the University of Kansas in 1988, Busch was Professor of Chemistry at Ohio State University in Columbus, Ohio.

He has long been active in the ACS. He was Chair of the Division of Inorganic Chemistry and serves on six editorial boards including the *Journal of Coordination Chemistry* and *Supramolecular Chemistry*.

The ACS Award for Computers in Chemical and Pharmaceutical Research Won by Hausch

Corwin H. Hausch, who received his B.S. at the University of Illinois in 1940, is Professor Emeritus of Chemistry at Pomona College. According to a colleague, "His seminal work in originating and establishing the field of quantitative structure-activity relationships (QSAR) has had a profound influence on the practice of medicinal chemistry with regard to the understanding of structure-activity relationships and the principles and practice of drug design."

Professor Hausch came to Pomona in 1944 after a brief stint as group leader at DuPont. He retired from Pomona in '88. Currently, he is a partner in BioByte, a Claremont, California based computer software and database company.

The 1999 ACS Award in Analytical Chemistry was won by Skoog

Douglas Skoog, who is Emeritus Professor of Chemistry at Stanford University, has written three influential textbooks for Analytical Chemistry. They are *Fundamentals of Analytical Chemistry*, *Analytical Chemistry: An Introduction*, and *Principles of Instrumental Analysis*. His books have been translated into numerous languages and the three books have gone through a total of 18 editions.

Professor Skoog earned a B.S. in Chemistry from Oregon State University in Corvallis in 1940, and a Ph.D. from the U. of I. in 1943 under the supervision of Professor Englis. From 1943 to 1947 he was a research chemist and group leader for Standard Oil of California (now Chevron) before taking a position at Stanford University in 1947.

In Memoriam

Guy P. Arnaud '70 M.S. (Chemical Engineering) has passed away.

Ransom E. Ashmore, '29 M.S. (Chemistry) has died. He had retired from DuPont in Louisville, KY.

Mrs. Helen M Corley, '23 A.M. (Chemistry) has died.

Lawrence H. Dunlap, '39 (Chemistry with Marvel), died in December, '97. He joined Armstrong and Cork Co., now Armstrong World Industries and remained with the company until his retirement in '75 as a senior research associate. During his service at Armstrong he rose to general manager of the Chemistry Division at Armstrong's Research and Development Center. His work made possible the development of modern vinyl flooring. Dunlap also served as adjunct professor of chemistry at Franklin & Marshall College from '47-'48.

In addition to his membership in the ACS, Dunlap was a Fellow of the American Association for the Advancement of Science and chairman of the Lancaster Branch. He was a Fellow of the American Institute of Chemists and a member of its Accreditation Committee.

William L. Eppelheimer, '79 B.S. (Chemical Engineering), died in March, 99. He was a process engineer with Air Products and Chemicals in Pasadena, TX.

Christa Gohrbandt Goers, '53 B.S, 54 M.S. (Analytical Chemistry with Malmstadt) died in Lübeck, Germany in October, '98. She attended Navy Pier.

Vincent P. Milo, '52 M.S. (Chemical Engineering) has passed away.

Eugene L. Ringwald, '41 B.S. (Chemistry) died in August, '98. He was a research chemist for 40 years at Monsanto and Chemstrand. He specialized in man-made fibers and polyester research. He retired in '81 and in '85 served as a consultant for International Service Corp. He was inventor or coinventor of several hundred international patents and 45 US patents.

Ronald Rosher, '39 A.M. (Chemistry) died in March '99 of complications from Parkinsons Disease. He was a supervisor at Hercules Incorporated in Magna, UT.

James H. Saunders, '46 Ph.D. (Chemistry with Marvel) died in October '98. After graduating, he joined Monsanto Corporation and transferred to Mobay Chemical in '55, rising to Research Director in '62. His major contributions included the development of integrated theories of interpretations of the factors involved in foam formation; in the relation between structure and properties of polyurethane; and in the thermal decomposition and combustion of polyurethanes. He led programs in fundamental research, process research, and applications research and development. In '68 he returned to Monsanto and became research director for nylon, polyester and acrylics in '75. In '81 he became General Manager of Technology for the Monsanto Textile Co.

Dr. Saunders was author, co-author, and editor of several books relating to his work on foam technology. After his retirement, he was adjunct professor at Washington University, St. Louis, MO, and at the University of West Florida in Pensacola, FL.

Alumni News

Philip N. James, Ph.D. '57 (Chemistry with Snyder), is temporarily "retired" and exploring the country in a motor home. He plans to get an apartment in Claremont, CA when he finishes his travels.

Walter L. Robb, M.S. '49, and Ph.D. '51 (Chemical Engineering with Drickamer), has won a 1998 Alumni Achievement Award from the College of LAS at the U. of I. Robb was Vice President of the Medical Development Department at General Electric from '73-'86 where he brought computed tomography (CT) scanning and magnetic resonance imaging (MRI) into common use as medical diagnostic tools. In '93, Robb received the National Medal of Technology for his work in medical imaging and a U.of I. President's medal. He is now founder and president of Vantage Management, a consulting firm, providing service to high tech companies aiming for medical advances.

'60s

James E. Dunn who earned a M.S. in '61 (Chemistry with Rinehart), has retired from executive positions and become a consultant in market research and environmental compliance.

Andrew T. Zander, B.S. '68 (Chemistry), was appointed Vice President of Research and Development at Transgenomic, Inc. in San Jose, CA. Transgenomic provides system solutions for molecular biologists and other scientists studying nucleic acids.

'70s

Nic Korte, B.S. '71 (Chemistry), has published a book titled *A Guide for theTechnical Evaluation of Environmental Data*. He works at the Oak Ridge National Lab's small office in Colorado and obtained a M.S. in Analyticel Chemistry from the University of Arizone in '73.

'80s

Mark Betczynski, B.S. '86 (Chemistry), reports that he earned a Master of Chemical Engineering (MChE) from Illinois Institute of Technology in '98. He is currently a Senior Environmentel Engineer at Equistar Chemicals' Morris Plant.

Alumni News continues on the next page

Alumni News

Serkos Haroutounian, Post doc '75-'86 with Katzenellenbogen, is Professor of Chemistry at the Agricultural University of Athens, Greece.

Michael R. Hill, B.S. '86 (Chemistry), earned a M.S. in Macromolecular Chemistry from the University of Detroit Mercy in December, 1998. He works as a Senior Development Chemist at BASF Corporation, Automotive OEM Coatings Division, Southfield, MI.

Alan Mast, B.S. '85 (Biochemistry), is a recipient of the 1998 Presidential Early Career Awards for Scientists and Engineers (PECASE). The award was made by the White House. Dr. Mast is a Pathologist and Assistant Professor at the VA Hospital in Memphis and at the University of Tennessee.

Scott Meece, B.S. '83 (Chemical Engineering and Mathematics), was promoted from Patent Counsel to General Counsel and Vice President of Regulatory Affairs for CIBA Vision Corporation as of January, '99.

'90s

Jocelyn Bautista, B.S. '91 (Chemistry), has completed a Neurology Residency at Yale University School of Medicine and is starting an Epilepsy Fellowship at the Cleveland Clinic.

Jeffrey A. Burns, M.S. '91 (Chemistry with Pirkle), received his MD from Eastern Virginia Medical School in spring, '99. He is now serving an orthopaedic surgery residency at the State University of NY, Stoneybrook, NY.

Jinwoo Cheon, Ph.D. '93 (Chemistry with Girolami), is an assistant professor at the Korean Advanced Institute for Science and Technology (KAIST).

Christine C. Fields, B.S. '91 (Chemical Engineering), has relocated back to the US from an oversees assignment in Istanbul, Turkey and is now a project manager with Renessen.

Chris Gross, Ph.D. '97 (Chemistry with Girolami), has joined the research staff of 3M.

Chris Hein, Ph.D. '97 (Chemistry with Girolami), has joined the staff of General Electric. He is with their Plastics Division in Mt. Vernon, Indiana.

Alumni News continues on the next page

A Tribute to Professor Stanley Smith

By Phillip A. Lisagor

Phillip A. Lisagor with daughter and wife.

It was with great pleasure that I read about Dr. Stanley Smith and his commitment to computer education in the spring, 1999 Alumni News.

I was an undergraduate enrolled in organic chemistry for the fall semester, 1965. It was a fast moving course geared to premedical students. I couldn't understand a word and suddenly realized I couldn't do this course. Somehow, I was allowed to drop the course. The following semester, I tried again, this time signing up for organic chemistry for chemistry majors. And this course, if memory serves me, was Chem 234 and was taught by Dr. Smith.

It was an off-sequence course, I guess, but from the first day I understood every word and every concept as explained in a personal manner by Dr. Smith. This continued throughout the semester, and, somehow, my poorest course was now my strongest area of study. And it was all happening without my having to spend hours memorizing. Instead, it just seemed to be a course in logic. And the added bonus was seeing Dr. Smith demonstrate an analog computer to plot out reaction curves. This was at the same time that I was learning Fortran (not very well) on the IBM 3600.

I learned the value and importance of a teacher who could teach students, not just teach the subject. Second, I learned that being a quick study isn't always that important. Third, I learned that people can learn at different rates and arrive at the same place.

I went on to take all of the organic chemistry courses available including the graduate level courses and even a research seminar with Dr. Pirkle. When I graduated with a degree in LAS-Chemistry, I continued my education at the University of Chicago in a combined MD-PhD program. Based upon my course work at the U. of I., I took my predoctoral exams at Chicago without taking any of their courses and, amazingly, passed them.

I learned a number of things from this experience at the U. of I. Department of Chemistry, centered about my experiences with Dr. Smith. First was the value and importance of a teacher who could teach students, not just teach the subject. Second, I learned that being a quick study isn't always that important. In my case, a second go at it was well worth the effort. Third, I learned that people can learn at different rates and arrive at the same place.

So, this is a note to put in perspective that Dr. Smith isn't just teaching with high tech tools, but has all along been a high tech teacher himself.

(Dr. Lisagor received his B.S. from the U. of I. in '67 and his M.D. from the University of Chicago in '72. He went on to take residencies in surgery and in cardiothoracic surgery. He held academic appointments at the University of Nevada '82-'84, at the University of Texas Health Science Center, '96 to the present, and at the Uniformed Services University of the Health Sciences, '96 to present. Since '94 he has been Assistant Chief of Cardiothoracic Surgery at the Brooke Army Medical Center in Fort Sam Houston, Texas.)

Kampmeier Wins National Teaching Award

Jack Kampmeier, who received his Ph.D. in organic chemistry under the tutelage of Professor D. Curtin in 1960, has spent his professional career to the Chemistry Department of the University of Rochester. Kampmeier has received a 1999 Chemical Manufacturers Association's National Catalyst Award for Excellence in Teaching for his success in adapting the Workshop model, developed at the City College of New York, to the teaching of organic chemistry. He is only the second chemistry professor at the University of Rochester to have received this award. According to James Farrar, chair of the Department of Chemistry, "This is a high-profile award and a real honor. Jack's work has had an impact on the national level."

Jack Kampmeier

Kampmeier developed the Workshop model in organic chemistry because he was convinced that "students have always had far more trouble with organic chemistry than they should. The gas station model, where students pull in, a professor or graduate student opens up their heads and pours knowledge in, and they drive off, filled up, just doesn't work."

The workshops are structured study sessions for small groups of students. The students brainstorm for solutions to complex chemistry problems. Peer leaders, who have studied the subject, take a training class. They create a comfortable, relaxed environment, where some students ask and answer questions more freely than in a traditional classroom.

Kampmeier has also developed a program that brings high school science teachers to the University, where they work directly with researchers in laboratories. This program allows the visitors to learn new laboratory techniques and new developments in the field. In turn they share these experiences with their own students.

In 1974 Kampmeier received the Edward Peck Curtis Award for Excellence in Undergraduate Teaching. He was a National Science Foundation science faculty fellow at the University of California at Berkeley in 1971-72. He was a Fulbright-Hays senior research scholar at the University of Freiburg in 1979-80 and a NATO senior scientist in 1979-80. Kampmeier served as Chairman of the Department of Chemistry from 1975-79 and as Dean of the College of Arts and Science from 1988-91. Since 1991, he has been Associate Director of the National Science Foundation Science and Technology Center for Photoinduced Charge Transfer.

Studying at leisure on the "quad."

Alumni News

Richard Kohlman, B.S. '95 (Chemistry), is Vice President for Engineering, and a consultant for Centec XXT, in Sunnyvale, California.

Wenbin Lin , Ph.D. '94 (Chemistry with Girolami), has taken a position as assistant professor at Brandeis University.

Stephanie A. Mabry, Ph.D. '96 (Chemistry with J. Jonas), has been promoted to Group Leader of Ethers Development at Rayonier's Specialty Pulp Products' R&D Center.

Robert Morris, Ph.D. '90 (Chemistry with Girolami), was awarded tenure and Ball State University.

Paige Morse, Ph.D. '90 (Chemistry with Girolami), has joined the staff of *Chemical and Engineering News*, specializing in the progress of the oil and polyolefins industries.

Melissa Nelsen, Ph.D. '96 (Chemistry with Girolami), has become an assistant professor at the University of Wisconsin-Superior.

David Allen Tree, Ph.D. '90 (Chemical Engineering with McHugh), has been promoted to Interim Associate Dean of Engineering and Research at Oklahoma State University, where he is also Professor of Chemical Engineering. He has been on the faculty at Oklahoma State since leaving the U of I. in '90.

Tianli Wen, B.S. '93 (Chemical Engineering), is currently studying for an MBA degree at the University of Chicago Graduate School of Business. Between his graduation from the UIUC in '93 end his return to student status, he worked for Procter & Gamble in Cincinnati for one year and in its Far East Headquarters in Kobe, Japan from '94-'98, as a Senior Engineer. Last summer, he conducted an internship for Microsoft at its Windows NT marketing group in Seattle.

He is very pleased with the progress made by the School in bringing in minority staff. He sends regards to the many Chemical Engineering professors who helped him develop "solid problem solving skills."

Yujian You, Ph.D. '96 (Chemistry with Girolami), has joined the research staff of Rohm and Haas.

The Craft Night Group Meets Monthly for Handwork and Sociability

For the last ten years, women graduate students and spouses of male graduate students have been invited by Vera Mainz, Director of the Chemical Science NMR laboratory, to gather at her house for conversation, to work at crafts, and to enjoy each other's company.

Although some beautiful articles emerge, the main purpose of the group is to make social contacts and to introduce graduate students especially among minority groups. Most of the craft night group come regularly and recruit others, some from units outside the School.

The photo shows a completed embroidery that will hang in the new home of a craft night regular who is about to marry. It was designed to register the coming event. Shellie worked on her embroidery for a long time, not just during craft night but also when traveling back and forth to finalize wedding plans.

The craft group does not limit itself to embroidering. Depending on an individual's inclination, the participant may prefer quilting, crocheting, knitting, or stenciling. One group put together an army of "little beaded ladies" as wedding favors. Some participants read to the group and some come just for relaxation and conversation.

Although some beautiful articles emerge, the main purpose of the group is to make connection with others, to introduce graduate students, and to encourage social contacts especially among minority groups.

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