

IOWA CHEMISTRY

The Newsletter of the University of Iowa Department of Chemistry, May 1999

A Message from the Chair

Newsletters serve the purpose of communicating to alumni and other friends of the Department of Chemistry, current information of significance. Responses from recipients of our recent newsletters indicate not only that there is strong and broad continuing interest in developments in the Department, but that more information would be appreciated. This edition of the newsletter contains an expansion of the transmission of information in response to your requests.

The information we present here is not unlike a report of *chemical transformations*, which for the synthetic chemist includes *products* generated, sometimes with surprises, and *yields* of desired products. The *yields* of our attempted *transformations* are controlled by resource streams from the University, the College of Liberal Arts, and donors to the University of Iowa Foundation. Just as with the synthetic chemist, the Department can make progress, or generate *products*, only if it continually attempts to bring about *transformations* directed at improving its ability to fulfill its mission.

The past year has been a very eventful period for the Department with the most significant developments found in faculty personnel, research space, research equipment, and instructional equipment. Transitions in the Department of Chemistry tenure-track faculty composition include arrival of a new faculty member, Dr. Sonya Franklin, a faculty retirement, Dr. H. Bruce Friedrich, and two successful searches for new faculty, Dr. Amnon Kohen and Dr. Norbert Pienta, who will join the department in August, 1999. The tenure-track

faculty will number 24 in the 1999-2000 academic year. It is anticipated that at least two searches for new tenure-track faculty will be conducted during the coming year.

Encouraging progress can be reported about research space, which is undoubtedly the most deficient commodity among those necessary for our Department to fulfill its mission. The past year has seen completion of the renovation of more than 2,000 ft² of research laboratory space in the Chemistry Building for new and continuing faculty. The fifth floor renovation project, to include ~6,500 ft² of research laboratories and two faculty offices, is in progress and should be completed by March, 2000. Architectural planning for 5,500 ft² of research space on the third floor of the Iowa Advanced Technology Laboratory has been completed and it is anticipated that the space will be available for occupancy in Spring 2001. Planning for the occupancy of space in the Chemistry Building to be vacated by Botanists in 2002 will be initiated this summer.

One of the most exciting *transformations* we can report is the continuing growth in Department of Chemistry endowments in the University of Iowa Foundation. Gifts from alumni and friends of the Department and the returns they have generated have resulted in more than a doubling of Foundation holdings over the past five years. This has made it possible for us to dramatically expand our support of undergraduate and graduate students in numerous ways including scholarships, fellowships, awards, and travel of graduate students to professional meetings. We continue to be buoyed by your interest in the Department and we encourage you to communicate with us.

A Note from the Editors

Our department continues to be dynamic; there are continuing and unpredictable changes as you will see in this newsletter. We are hopeful that this year's newsletter will keep you abreast of a few things that have happened in the last year. We are somewhat limited by space and hope that our selection of articles is representative of our department. To get additional information on the department visit our web page:

<http://www.uiowa.edu/~chemdept>
Specific details of our faculty can be seen there including publications and research interests.

D.C. Tardy and D.F. Wiemer

Nair Becomes an AAAS Fellow

The Department is honored to have one of its members recognized and selected by the world's largest federation of scientific and engineering societies. In January Professor Vasu Nair became a Fellow of the American Association for the Advancement of Science (AAAS); Vasu was one of 30 scientists from the Chemistry and Biochemistry disciplines (National and International) who were chosen. Fellows are elected by members of the AAAS based on their contributions and efforts toward advancing science that are scientifically or socially distinguished. Nair is internationally known for his work on antiviral compounds; he has designed, synthesized and patented antiviral compounds that are important in slowing the growth of HIV. He received a plaque with the inscription: **For the Development of Nucleoside-based Antiviral Agents.** After working as a research fellow with Nobel Laureate R.B. Woodward at Harvard, Nair joined our Chemistry Department in the 1969-70 academic year. Since that time he has received national and international honors and awards, including a Doctor of Science degree from the University of Adelaide. In 1993 Nair became a UI Foundation Distinguished Professor. Although he is busy providing service to the University, teaching and doing research he enjoys working in his rose garden.

Alumni

Last year many of you responded to our request for news about what is going on in your lives by filling in the 'boxes' on our web page. This information is being stored in a database. This is

an ongoing project, so if you have something to give us then either email us at chemdept@uiowa.edu or surf the web at (<http://www.uiowa.edu/~chemdept/alumni> and Let us know if you want your name, address, etc. to be kept private.

We received a variety of input from our alumni. The respondents were located throughout the US and Germany; they graduated in the past 40 years with BS's, MS's, MD's or PhD's. Some are retired while others are just starting their graduate studies; others work in academics, government labs or private industry. Their jobs include areas such as developing contrasting agents for radiology, separations, bioanalytical, computations, drug screening.

Many felt that new directions in chemistry were topics doing with solving environmental problems. Multidisciplinary research was a key component; the importance of communication between the disciplines was stressed. With these new directions, new teaching strategies need to be developed.

When asked about courses that were important, the range was also diverse. One person liked p chem more than anything else but found qual organic and organic very helpful. A few wished they had taken a few courses outside of chemistry: math, education, business, German. A few thought a course in good laboratory practices, petroleum chemistry, polymer chemistry and computational chemistry would be helpful. In the past two years the last two have been offered!

Keeping in Touch & Visitations

We always like to hear from our alumni, whether by email, the web, letter, phone, etc. Our hope is that you will pay us a visit so that we can share with you what is happening and hear what you are doing. The following alumni visited the Department in 1998; their research advisor and year of graduation are in parenthesis:.

Adam Capitano (Grassian, former undergraduate student) received his Ph.D. from the University of Michigan; **Diana Cermak** (Wiemer, PhD, 1997) is an Assistant Professor at Knox College in Galesburg, Il; **Steve Cermak** (Wiemer, PhD, 1998) is Staff Scientist at USDA Regional Laboratory in Peoria, Il; **Hoeil Chung** (Arnold, Ph.D., 1994) attended the Pittsburgh Conference; **Salem Farooqui** (Grassian, former

undergraduate student) visited Iowa City friends; **John Jackson** (Wiemer, PhD, 1990) promoted to Associate Professor at Youngstown State University in Youngstown, Ohio. Fr. **Dennis Koopman** (Burton, MS, 1972) is now stationed at the Friary in Chicago. How about a visit from you next year!

Chemistry-Botany Library Closes! (Chemistry Library Begins Service)

An institution familiar to all of our alumni, the Chemistry-Botany Library, recently closed its doors. Immediately thereafter, and at the same location, the Chemistry Library opened for business, almost as usual.

The immediate impact on the Department of Chemistry will be in the form of additional staff attention to the needs of the chemistry collection. Among other things, the staff will be able to spend more time on the transition of the Chemistry collection into a more electronic format, and on keeping the already available electronic materials linked through the Chemistry Library web page (<http://www.lib.uiowa.edu/chem>). Also, according to Leo Clougherty, the Head of the Chemistry Library, this may make it possible to recall some of the chemistry materials currently housed in storage and make them more accessible to chemistry researchers. Furthermore, the increasing reliance on computer technology had created cramped quarters in this branch library, as computer desks took space once allocated to study carrels. The newly available space will also be used to rebalance this equation, and make this library more convenient for its many users.

The Botany materials, which used to co-inhabit the Library, have for the most part been sent to storage or moved to the new Biological Sciences Library. This state-of-the-art facility is housed in the old Annex building between Phillips Hall and the Biological Sciences Building. The interior of the old structure was completely refurbished and now holds the library materials and an electronic teaching lab. However, since most of the faculty dealing with plant sciences are still housed in the Chemistry Building, the most useful plant sciences journals will be housed in the Chemistry Library for the foreseeable future. When the renovation of the Biological Sciences buildings is complete, these faculty will be united with the other members of

their department and the last biology journals will be moved out.

Graduate Students

This past year our number of graduate students averaged around 90; this is down a bit from last years enrollment. Our graduate students remain very busy doing research, studying and presenting papers at local and national meetings. This year **Lynne Remer** received an **Outstanding TA Award** for her teaching in Physical Chemistry.

In 1998 we awarded 14 PhD's in Chemistry; 10 in organic chemistry. Here is a listing of our new PhD's in chemistry with their advisors and Dissertation title.

Tracy J. Baker (Wiemer: Synthesis of Nonracemic Phosphonates and N-Acyl Mannosamines.), **Shelly B. Blunt** (Wiemer: Naturally Occuring Prenylated Phenols: Structure Determination and Syntheses.), **Steven C. Cermak** (Wiemer: Directed Ortho Metallation in the Synthesis of Isoprenoid Natural Products.), **Gary DeBoer** (Young: Photochemistry and Dynamics in Weakly Bound Complexes: Charge-Transfer and Cage Effects), **Arlen Jeffrey** (Wiemer: Acyclic Nucleoside Phosphonates: Design and Synthesis of Novel Antiviral Agents.), **Qibo Liu** (Burton: Novel Synthetic Chemistry of the Trans-1,2-Difluoroethylene Synthone and Symmetrical 1,3-Diynes.), **Mark F. Mechelke** (Wiemer: "Heads and Tails" The Design and Synthesis of Novel RAS Farnesyl Protein Transferase Inhibitors), **Todd Miller** (Grassian: Heterogeneous Reactions of Nitrogen Oxides on Metal Oxide Particles), **Hyuncheol Oh** (Gloer: Chemical Investigations of Chaetomium Sp. and Aquatic and Sclerotium-Producing Fungi), **Monali Sawai** (Quinn: Reaction Dynamics and Transition State Structures of Beta-Lactamase and Acetylcholinesterase Catalyzed Hydrolysis Reactions), **Yue-Xin Su** (Jordan: Novel Tantalum Carborane Chemistry), **Barbara Tsuie** (Jordan: New Chiral Amide Ligands Derived From (+/-)--trans-1,2 Diaminocyclohexane Applications In Titanium (IV) and Zirconium (IV) Chemistry), **Jeffery Wilson** (Wiemer: Synthetic Studies of the Ascochlorin Family), **Xiaoping Zhang** (Nair: Novel Isomeric Dideoxynucleosides and Dideoxynucleotides: Design, Synthesis, and Characterization)

Undergraduate Students

Our number of undergraduate chemistry majors has decreased. This spring we had 38 seniors, 21 juniors, 20 sophomores and 6 freshman for a

total of 85. In 1998 there were 21 chemistry majors who graduated; 2 with the BA and 19 with the BS degrees. Many of our undergraduate majors are associated with a research group and have the joy of doing research. Each spring we have a poster session where they share their research experience with the department. At this time the Chemistry Alumni Awards are announced. This years recipients were:

sophomore: **Farid Moussavi-Harami**
junior: **Katherine Lindstrom**
senior: **Jason Kruger**

The Merck award was received by **Michael Harder** while the Russell K. Simms Scholarships were earned by **Eric Balster, Paul Imming** and **John MacMillan**. The American Institute of Chemists awards were received by **Jolynne Roorda**.

We continue to bring in undergraduates from other undergraduate institutions. This provides the student an opportunity to do research in an environment different from what they are accustomed. Last summer **Renier Vélez-Cruz** from University of Puerto Rico-Mayaguez Campus and **Everett Nixon** from Southern University at Baton Rouge experienced undergraduate research in our Department.

Chemistry Department Benefits from GAANN Award

An important new grant was awarded to the Department of Chemistry last summer, by the Department of Education through its Graduate Assistance in Areas of National Need (GAANN) program. This grant is intended to support fellowships for under-represented minorities who would like to pursue the PhD degree in Chemistry, and to encourage them to consider academic careers. It has had a significant impact on the graduate student population of the Chemistry Department, both in terms of the diversity of our students and in terms of their total numbers.

According to Darrell Eyman, the principal investigator on the award, the total funding in this grant was in excess of \$500,000. Together with some matching funds from the University of Iowa, it will allow the award of seven 3-year fellowships to Native American, African-American, and Hispanic-American students. Each fellowship will provide a student with a full

stipend, pay tuition and fees, and allow some travel to scientific meetings. Furthermore, the University has provided additional support to allow faculty recruiting trips to Virginia, Georgia, Texas, and Louisiana, in addition to visits to traditional recruiting spots in Wisconsin and Illinois.

The first five students who received these awards joined our Department in August, 1998 and January, 1999, and have expressed research interests across the range of our department. Two additional appointments are expected in August of 1999. Because the Department of Education program allows the possibility of renewal grant applications, we hope that this represents the beginning of a long-term association.

Laboratory Courses for our Chemistry Majors

Last year we talked about the new courses that we introduced for our majors. This year we are going to give you a more detailed report on the sophomore level lab courses.

Basic Measurements

As the second laboratory course for the chemistry majors, Basic Measurement (4:21) was designed to prepare students with a solid background in chemical measurements and data analysis. Basic statistical tools for scientific measurements, such as the error distribution and propagation, linear and nonlinear regression, are discussed and implemented with spreadsheet programs. To reinforce the concepts and principles students learned in general chemistry, the course encompasses a set of experiments involving complex thermodynamics and kinetics. For example, a third-order reaction is studied with FTIR in experiment "Kinetic Study of the Reaction Between Ethanol and Chloroacetyl Chloride by FTIR" and a complex equilibrium system is investigated in experiment "Gran and Schwartz Plots: Complex Acid-Base Equilibrium". In addition to these experiments on fundamentals of chemistry, a major emphasis of the course is to expose the chemistry majors to current research activities in chemistry. Experiments such as "Synthesis and Size Determination of Quantum Dots" and "Spectrophotometric Investigation of Ligand-Protein Binding" give the students hands-on experience in laboratories related to current

research activities in various fields, such as material science and biological science. The hope of these experiments is to stimulate students' interests in chemical research and broaden the students' horizon at an early stage of college education.

An extra credit assignment is included in the course: Critical Reading of a Research Paper. For the assignment, a list of journals is given to the class, including *Science*, *Nature*, *Proceedings of the National Academy of Sciences of the U.S.A.*, and *Journal of the American Chemical Society*. Students get into the libraries and read the current issues of these journals. Each student picks one favorite article from these journals and writes a paper discussing the objectives, methodologies and conclusions of the article. The student is also required to provide comments on the general methodology of the article and suggest possible future directions for the research. The objective of the assignment is for the students to get in the library and to start reading research articles. The assignment also helps to establish critical and independent thinking that is the core of science.

Intrigued by the experiment on quantum dots, a student started his independent research in transitional metal chemistry in the chemistry department. After extensive computer analysis of experiment data throughout the semester, students become experts of spreadsheet programs at the end of the course. The extra assignments have showed students' interests in a wide variety of topics in research, from the atomic laser to the global migration of CO, from the reovirus therapy of tumors to the Na⁺ channels.

Organic Laboratory

With 300 MHz NMR and benchtop GC-MS instruments available in an adjacent lab, undergraduate majors now have routine "hands on" access to the primary spectroscopic tools of modern organic chemistry. They use these tools to conduct increasingly sophisticated experiments. For example, in one synthetic sequence, students use n-BuLi to prepare lithium diisopropyl amide (LDA), use the LDA to generate a kinetic enolate from pulegone, and trap that enolate through reaction with methyl iodide. After partial purification of their initial product by column chromatography, GC-MS analysis of the product mixture is used to establish the ratio of diastereomeric products formed in their individual reactions. In another

experiment, students conduct a series of synthetic steps ultimately resulting in formation of the Davis reagent camphorsulphonyloxaziridine. They then use NMR spectroscopy and optical rotations to gauge the purity of their products, with a friendly competition between the two sections to see who can produce the largest sample of the most pure product. Finally, in the grand finale of the semester, students identify an organic unknown using mass spectrometry and ¹H and ¹³C NMR spectroscopy, in addition to more classical wet chemical analysis and IR spectroscopy. Each of the unknowns is drawn from a list of compounds provided to the students. That list is now the entire catalogue of the Aldrich Chemical Company!

As you can imagine these courses cover many exciting and diversified areas of chemistry. The end result is a very rewarding experience. After conducting experiments like these in the sophomore-level courses, our students are better prepared for still more challenging experiments in their junior and senior labs, can participate in undergraduate research on a more advanced level, and ultimately should be better prepared to pursue careers in industry or graduate study.

Staff Update

Several new staff members have joined the Chemistry Department over the past year, including Michele Gerot (Clerk IV), Frank Turner (ERD Machinist), and Mike Webb (Computer Consultant).

Michele Gerot, formerly in the UI Registrar's office, joined the Chemistry Department staff in August of 1998, and works in the Undergraduate Chemistry Center. She provides information and support to undergraduate students, teaching assistants, and faculty on all undergraduate courses, and provides back-up support for graduate recruiting and admissions.

Frank Turner joined the Chemistry Department Machine Shop in October 1998, and holds a shared appointment with the UI Hydraulics Laboratory. While he works primarily in the machine shop (Room 27a CB), where he assists faculty and students with their needs in projects such as instrument construction, he can also be found around the building making "house calls" as needed.

Mike Webb, formerly a UI student, joined the College of Liberal Arts Information Systems Office in September of 1998. While officially a member of the CLA staff, his office is located in the Chemistry Building and his primary activity is to service the Chemistry Department's computer needs. As our LAN grows in complexity, faculty acquire new computer-controlled instrumentation, and computer viruses creep into our systems, addition of a computer consultant has been viewed as a modern necessity.

Visiting Faculty Update

Two new Visiting Assistant Professors have joined our faculty in 1998-1999. Dr. **Jason Telford** received his PhD at the University of California-Berkeley, for work conducted with Prof. Ken Raymond, and then held a NIH Postdoctoral Fellowship while associated with Prof. Harry Grey at the California Institute of Technology before coming to the UI. He has taught General Chemistry II (4:8) this past year. Dr. **Chuck Williamson** came to the UI as a teaching postdoctoral associate in the Physics Department after completing his PhD at the California Institute of Technology, and is teaching Principles of Chemistry II (4:14) this spring before beginning a faculty position at Willamette College this summer. Drs. Telford and Williamson join our other visiting faculty: Dr. **Doris Eckey** (University of Minnesota), Dr. **Lisa Fields** (University of Illinois), Dr. **Russell Larsen** (Harvard University) and Dr. **Timothy Smith** (University of California-Berkeley), in providing important contributions to our freshman and sophomore courses.

Faculty

At the start of the next academic year we will have the same number of permanent faculty that we started with this year. However, the faces will be different.

After 33 years at Iowa **Bruce Friedrich** has decided to make a change; he will remain in Iowa City and be working part time as a consultant. His new job will be reviewing and evaluating scientific programs. Bruce has had a variety of *views* of our department; a few were: graduate student, professor, chair, overseer of first major renovation project, member of the

Graduate Council and of the Faculty Assembly. Each *view* often required hard and sometimes thankless decisions; his manner of solving problems is exemplary. He has taught a variety of introductory, analytical and physical chemistry courses to all levels of students. Bruce was the mentor and directed the research for the following PhD students: **David Sevenich** (1990), **Jung-Pin Yu** (1987), **Robert Wandro** (1984), **Terrance Rooney** (1972), **Paul Krause** (1972), **David Garrett, Jr.** (1972), **Robert Carlson** (1971). He also played an important role in the PhD dissertations of **Daniel Kolbow** (1983), **Sean Brennan** (1982), **Duane Pierson** (1982) and **Herbert Leary** (1971). We will miss his leadership, thoughtful discussions, wisdom, sense of humor and high standards. In addition to teaching challenging courses Bruce contributed to the AXE activities; the AXE members gave a farewell BBQ for Bruce at the end of the semester. Bruce, enjoy your 'retirement'; we will miss you.

Our newest organic faculty member, Dr. **Amnon Kohen**, will join the department this August. Dr. Kohen is a native of the state of Israel, where he earned his Ph.D. in 1994 under the direction of Timor Baasov at the Israel Institute in Haifa. Since 1995 he has worked as a Postdoctoral Fellow in the laboratory of Professor Judith Klinman at the University of California-Berkeley. Dr. Kohen's teaching interests are undergraduate organic chemistry, and graduate physical organic and bioorganic chemistry. His research interests are in the study of the detailed dynamics of enzyme-catalyzed reactions. He will continue the study of the role of quantum mechanical tunneling in enzymic hydride transfers, a topic on which he developed considerable expertise while working in the Klinman laboratory. He also plans to study the enzyme nitrogenase, which produces ammonia from elemental nitrogen with decidedly greater ease than the industrial process which is so important to the production of corn in Iowa. The department is looking forward to welcoming Dr. Kohen and his young family to the Iowa City area this summer.

We are also pleased to announce that Dr. **Norbert Pienta** will join our faculty this summer. Dr. Pienta will be appointed as the product of a national search to fill a chemical educator faculty position in our Department. Dr. Pienta is currently Director of Laboratories in the Chemistry Department at the University of North

Carolina. He was previously a tenured organic chemistry faculty member at the University of Arkansas, and in 1989 he elected to make a transition to the area of chemical education with the move to North Carolina. Dr. Pienta is active in the chemical education community and he plans to do research in the areas of teaching assistant training and technology in learning.

Starting with **Harold Goff** in 1982 the Department has received 8 Faculty Scholar Awards from the University. This year, **Johna Leddy** continued are streak; her award was to work on Magnetic Effects on Electron Transfer Rates. She will have a semester off from teaching for the next 3 years to pursue work on that project

Department Instrumentation Update

During this past year, several major new instruments have been added to our equipment base, support has been acquired that will allow further major additions, and numerous smaller items have been purchased to improve the climate of our instructional labs.

Our research capabilities have been significantly enhanced with addition of a new NMR spectrometer and acquisition of support for purchase of a new mass spectrometer. NSF funding, first reported in last year's Newsletter, has allowed purchase of a new 400 MHz NMR equipped for pulse-field gradient experiments. It is now located in the UI High Field NMR Facility on the ground floor of the Chemistry Building, and recently came "on-line." Together with the four other high field NMR spectrometers already in the building (300, 300, 360, and 600 MHz), this instrument allows us to continue a tradition of first rate NMR research facilities. In addition, we've recently been notified that an NIH proposal for a mass spectrometer has been funded. This grant will allow purchase of an LC-MS/MS instrument, which will extend our present MS capabilities in terms of both sensitivity and mass range while allowing analysis of very complex mixtures.

Instructional equipment also has improved significantly over this past year. The College of Liberal Arts and the Vice-President for Research jointly supported the purchase of a 300 MHz

NMR spectrometer. This instrument, located in Room 215 adjacent to the labs used for teaching our Chemical Sciences Majors courses, is primarily to be used for undergraduate instruction. However at times when instructional demands are light or classes are not in session, it will be available for research use as well. An internal award from the UI fund generated by computer fees and an external grant from the Dreyfus Foundation will be used to purchase computers, interfaces, and computer-controlled spectrophotometers for the introductory laboratory courses, Principles of Chemistry laboratory (4:16) and Chemical Sciences Laboratory (4:20). The computers and interfaces will provide students with valuable experience with computer-controlled data acquisition and data analysis. Finally, the accumulation of chemistry lab fees has generated a fund to be used to update and expand instrumentation in our undergraduate courses. To date, the major purchases from the lab fees have been 2 FTIR spectrometers, 6 rotary evaporators, a magnetic susceptibility balance and 26 digital spectrophotometers. In addition, the lab fees provided cost-sharing for the purchase of the computers and interfaces described above and also were used to purchase general use items such as balances, chart recorders, centrifuges, and glovebox accessories. Thus students will be able to conduct more complex experiments in their undergraduate lab courses, and employ more of their lab time for actual experimentation rather than waiting in line.

The quest for first-rate instrumentation is a constant in modern chemical research and instruction. Fortunately, by drawing on both external and internal sources of support, we have been able to make a number of significant acquisitions over the past year.

Remodeling Continues to "Chip Away" at CB

While a new Chemistry Building is unlikely in the near future, and the major space addition that will occur when former Botany faculty join their colleagues in the new Biology facilities is still some time away, a number of small renovations have taken place in CB this year. These projects include remodeling of the 323 area until recently occupied by Prof. Leo Davis, and the 337 and 341 research laboratories formerly used by Profs. Goff and Eyman.

Renovation in the 323 area began in January and was completed by the end of April, to provide a new home for the research group of Prof. **Johna Leddy**. Renovations have involved installation of numerous communication lines to handle a network of 14 lab computers, as well as complete renovation of the interior space and new hood arrangements. A new laboratory with state of the art gas handling systems has been provided for a fuel cell testing lab. This includes explosion proof gas cabinets as well as alarm and shut down systems which are triggered by inappropriate levels of hydrogen and oxygen. Throughout the space, lighting, electrical service, and paint has been updated.

At the same time, renovation of rooms 337 and 341 has been undertaken to provide appropriate research space for our newest faculty member, Prof. **Sonya Franklin**. Room 337 had a facelift with modifications to shelves, outlets, and faucets, as well as a new coat of paint and sealant for the hoods and benches. Room 341, however, was completely transformed from a storage area with one entrance and no benches, hoods, or sinks, to a beautiful lab with two doors, two hoods, specialized 32-P radiation bench, lots of storage space, and a central island. The Franklin group (already 2 graduate and 2 undergraduate students) has moved in with the last component of a new laboratory--the chemistry!

A larger remodeling project, renovation of the SE section of the 5th floor, is now underway. Approximately 6,600 square feet of laboratories and support areas will be converted to modern research space for organic chemistry. As reported last year, this project is supported by a grant from the National Science Foundation with matching funds from the UI. Research groups headed by Profs. **Gloer** and **Wiemer** will occupy the renovated space early in the year 2000, but more chemistry groups should be moving to the 5th floor in the future. Once construction of the new Biology building is complete, longer-range plans call for remodeling the northeast wing of the Chemistry Building to provide the Department with more space appropriate for chemical research and instruction. In addition, the Department of Chemistry has received a commitment that half of the third floor in the IATL, about 5500 sq ft, will be used to house the research groups of chemistry faculty, and architectural plans for finishing this space are

now being drawn.

Frontier Speakers Approach 50

The Research Frontiers in Chemistry Program continues to bring noted chemists to the department; we just had number 49 in the series! This year we were honored to have Professors Stephen **Leone**, David **Hercules**, Alan **Marshall**, Kendall **Houk**, Stephen **Lippard** and Robin **Hochstrasser**. The Frontiers series complements are departmental colloquia and divisional seminars.

Next year also has an impressive list of visitors. Here are the dates if you have an opportunity to come and listen. Let us know if you would like to be put on the mailing list.

Kenneth N. **Raymond**, University of California at Berkeley, Sept. 29, 30 & Oct. 1, 1999

John D. **Corbett**, Iowa State University, October 6, 7 & 8, 1999

Peter G. **Wolynes**, University of Illinois, November 8, 9 & 10, 1999

Robert **Bergman**, University of California at Berkeley, March 6, 7 & 8, 2000

Larry E. **Overman**, University of California at Irvine, March 20, 21 & 22., 2000

Richard **Zare**, Stanford University, April 24, 25 & 26, 2000

Research and Visiting Scientists and Postdoctorals

In addition to undergraduate and graduate students many research groups have major contributions from visiting scientists and postdocs. Professor **Masafumi Kobayashi** from Kanto Denka Kogyo (Japan) is working with Professor Burton on the **Stereospecific Synthesis of Polyfluorinated Polyenes**. In Professors Nair's group Dr. **Suresh Pal** is working on the **Biocatalytic Synthesis and Enzymology of Nucleosides and Nucleotides** and Professor **Guisen Zhao** from Chan Dong Medical University (Peoples Republic of China) is working on **New Isomeric Dideoxynucleosides Potential Inhibitors of HIV Replication**. Professor **Kang-Yeoun Jung** from Kangnung University (Republic of Korea) is working with Professor Wiemer on the **Synthesis of Novel Phosphonates**. A list of the postdocs, their sponsors and projects they are working on follows.

Airat Amerov (Arnold: Noninvasive blood glucose monitors for managing diabetes),

Arezki Boudif (Goff: Synthesis and redox properties of model lactoperoxidase hemes), **Xiaohong Bei** (Jordan: Titanium carborane complexes), **Sanjib Bera** (Nair: Conceptually New Inhibitors of HIV Reverse Transcriptase), **Jean-Francois Carpentier** (Jordan: Model complexes for intermediates in olefin polymerization), **Osvaldo Casagrande** (Jordan: Single site olefin polymerization catalysts), **Hachull Chung** (Ledy: Magnetic Modification of Fuel Cells), **Fabien Delpech** (Jordan: Chemistry of cationic indium alkyl complexes), **Mohamed El-Maazawim** (Grassian: Adsorption and Photocatalytic Oxidation of Carbonyl and Aromatic Compounds on Titanium Dioxide), **Barry Hu** (Arnold: Near infrared monitors for controlling protein crystallization), **Eiji Ihara** (Jordan: Cationic aluminum alkyl complexes), **Visvaldas Kairys** (Jensen: A frozen LMO based approach for the Effective Fragment Potential method), **Andrey Korolev** (Jordan: Chemistry of cationic aluminum alkyl complexes), **Jae Yeol Lee** (Totah: Transannular Reactions of Macrocyclic Lactams), **Ping Li** (Grassian: Heterogeneous Reactions of Carbonyl Compounds on Mineral Oxide and Carbon Particles), **Naozumi Nishizono** (Nair: Aminoglycosides as Potential Inhibitors of HIV Replication), **Allyn Ontko** (Eyman: Mechanistic Characterization of Alkyl Halide Reductions by Cyclohexadienylmanganese Derivatives), **Alexander Panov** (Grassian/Larsen: Selective Photooxidation Reactions of Hydrocarbons in Zeolites), **Debasis Patra** (Totah: Modified Spiroketals as Chiral Ligands for Asymmetric Induction), **C. Radzewich** (Jordan: Cycloaddition reactions of aluminum diketiminate complexes), **Catherine Reck** (Jordan: Novel tantalum ansa-carborane complexes), **Pawan Sharma** (Nair: Synergistic Inhibitors of HIV Infectivity), **Punit Seth** (Totah: Synthesis of Highly Functionalized 1-Oxadecalins), **Byung Ick Seo** (Nair: Potential Inhibitors of HIV integrase), **Michael Taktakishvili** (Nair: Novel Model DNA Systems), **B. Thiyagarajan** (Jordan: Synthesis of chiral metallocene olefin polymerization catalysts), **Grant Underwood** (Grassian: Surface Reactions of NO₂ and HNO₃ on Mineral Oxide Particles in the Atmosphere), **Junquan Wang** (Totah: Synthesis of Highly Functionalized 1-Oxadecalins), **Xingwang**

Zhang (Jordan: Synthesis of chiral metallocene olefin polymerization catalysts)

These scientists bring and share their rich background to the department.

Patents

Through patents, publications, and presentations, Departmental research accomplishments are presented to the scientific community. Of these, patent activity provides unique opportunities to bring resources to the Department. Intellectual property developed at the University of Iowa is managed by the University of Iowa Research Foundation (UIRF). UIRF was founded as a nonprofit 501(c)(3) corporation in 1975 to better capitalize on technological advances made by University researchers. When a research or design advance is made, the researcher sends a disclosure to the UIRF. After successful review by a University committee, the UIRF pairs the researcher with an appropriate patent attorney, and they work to prepare a patent application. The application is sent to the United States Patent & Trademark Office and possibly to other patent offices for protection in foreign jurisdictions, and after appropriate review, a patent may be issued.

Intellectual property can be licensed to commercial concerns through a licensing agreement. The license allows the commercial concern to develop and commercialize intellectual property, thereby facilitating technology transfer. Under University policy, revenues received under license agreements are first applied to unreimbursed patent expenses, with any remainder split in equal parts between the inventors, the originating Department, the UIRF, and the Vice President for Research (where the funds are designated for research enhancement).

Recent patent activity in the Department of Chemistry includes several issued patents and filed applications. The research areas run the gamut from optical sensors to virus mediate gene transfer to magnetically modified fuel cells and batteries. Several of these are listed below.

H. Chuang and **M.A. Arnold**, "Optical sensor with radioluminescent light source", U.S. Patent 5,708,957, January 13, 1998. This patent describes the use of radioluminescent light (RL) sources for optical chemical sensors. The utility

of RL sources for chemical sensing is demonstrated with an oxygen sensor. In this device, dissolved oxygen is measured by fluorescence quenching of an immobilized ruthenium dye. The RL source provides the excitation radiation to follow the ruthenium fluorescence. RL sources provide sensing excellent properties for remote, long-term applications. These sources are self-powered which dramatically reduces external power requirements for the sensor. In addition, RL sources are essentially noise-free which provides excellent limits of detection and high sensitivity. The RL-based oxygen sensor is being developed as an on-line monitor of various bioreactor units designed for space flight experiments in conjunction with NASA scientists.

David Wiemer, John Lee, Mike Welsh, et. al. "Engineering Novel Cell Surface Receptors for Virus-Mediated Gene Transfer", U.S. Patent application filed.

Johna Leddy, Sudath Amarasinghe, et. al., "Magnetic Composites Exhibiting Distinct Flux Properties Due to Gradient Interfaces", U.S. Patents 5,871,625; 5,817,221; and 5,786,040; CIPs filed in June 1995. This invention describes composites formed of magnetic microparticles and ion exchange polymers. Such composites have been shown to enhance significantly the

flux of molecules and ions to an electrode surface, and the enhancement is correlated with the magnetic properties of the transported species. These nanostructured materials have applications in separations and numerous electrochemical systems, such as metal ion separations, fuel cells, batteries, oxygen sensors, plating, solar and photocells. The composites can be used to improve fuel cells and effect transport and separation of different species of materials different magnetic susceptibilities. Some composites can be used to make a dual sensor for distinguishing between two species of materials and a flux switch to regulate the flow of a redox species and a flux switch to regulate the flow of a chemical species. Applications include (1) Batteries (longer life cycle, shorter discharge and recharge); (2) Fuel cells (higher flux through greater efficiency and improved kinetics); (3) Electrosynthesis (organic electrofluoridation as well as inorganic applications); and (4) Others : Photocells, photovoltaics, solar cells, depositions and plating

For additional information about these patents and potential licensing opportunities, please contact the faculty member or Brenda Akins at the UIRF (319- 335-4549 or brenda-akins@uiowa.edu) or view the UIRF's web page at <http://www.uiowa.edu/~vpr/techtran/license.htm>.