

IOWA CHEMISTRY

The Newsletter of the University of Iowa Department of Chemistry, May 2000

Greetings from the Chair

Another year has passed in the Department of Chemistry at the University of Iowa, and with it has come numerous changes. Prominent among these is that Darrell Eyman relinquished the Chairman's position in August of 1999 to return to full time teaching and research. A major new grant from Honda means that the Eyman group is again building for a sustained period of research productivity. Darrell brought many beneficial changes and innovations to the Department in his eight years at the helm, about which you will be apprised as you read this newsletter. Alumni and friends of Iowa Chemistry, please join me, my faculty colleagues and our students in saluting Darrell Eyman on the sterling service that he has rendered our Department!

As my first year as Chair of the Department nears its end, there are signs of progress all around. Three faculty, Robert Linhardt and Amnon Kohen (both bioorganic chemists) and Norbert Pienta (a chemical educator), joined the

Department in August of 1999. Two additional faculty, Len MacGillivray (synthetic chemistry in the solid state) and Jason Telford (a bioinorganic chemist) will join us in August of this year. These new faculty add to our considerable strengths in the biosciences and in chemical synthesis, and provide the opportunity in the coming years to retool our freshman chemistry teaching program for the 21st century. Other stories of progress and change will command your attention as you read through this newsletter.

Perhaps most important, the coming year is one in which the Department of Chemistry commits itself to renewing and nurturing contacts with you, our alumni and friends. We invite you to inform us of the notable events in your lives since you have left the University of Iowa. This you can do in the space provided on the last page of this newsletter, or via the web at <http://www.uiowa.edu/~chemdept/alumni/>. The information that you provide will be printed in next year's edition of the newsletter.

A Note from the Editors

Once again we try to relay to you the continual changes that we are creating and the changes that we are exposed to. We selected some representative stories to keep you abreast of what is new at the UI Chemistry Department. Heroic efforts from **Marsha Koehler** and **Sharon Robertson** in gathering data are gratefully acknowledged. To get additional information on the department and our faculty (publications and research interests) visit our web page:

<http://www.uiowa.edu/~chemdept>

E. Gillan, D. Quinn and D. Tardy

Eyman: Beyond the Chair

The summer of 1999 marked a time of transition in the Chemistry Department when Darrell Eyman stepped down from his position as Department Executive Officer. He had served in this capacity since 1991, in essence leading the department through the decade of the 90's.

This period was a time of great change for the Department. Nowhere is this more evident than in the ranks of the faculty. More than half of the current faculty joined the Department over this period, including Profs. Kohen, Linhardt, Pienta, Franklin, Gillan, Jensen, Larsen, Geng, Simmeonson, Leddy, Totah, and Young, primarily taking the places of people who retired or departed. Darrell Eyman's efforts to meet the research needs of these new faculty ranged from securing appropriate start-up packages to remodeling research space, updating major instrumentation, and finding them released time to build their research programs. Acquisition of external funding for renovation of 5,000 ft² on the 5th floor of the Chemistry Building has upgraded the research facilities for two senior Professors and made their previous research space available as start-up space for new hires and expansion space for other faculty.

Darrell Eyman led the Chemistry Department through a period of great change in our teaching programs. Institution of new courses for chemistry majors at the freshman and sophomore level may be the most obvious change in our curriculum, but there were many others. The establishment of laboratory fees has resulted in a dramatic elevation of the quality of laboratory instruction. Formation of the Chemistry Center and assembly of a strong support staff there has aided teaching of our largest non-major classes.

A significant expansion in the number of TA positions has allowed real improvements in the teaching labs and other undergraduate courses while supporting our graduate program at the same time. A strong staff in the Department Office, Chemistry Stores, and our shops and facilities, has made it possible to run this substantial enterprise in an efficient manner. Initiation of the Research Frontiers in Chemistry lecture series has served to augment our graduate teaching mission and to reveal the current department to more than 50 high profile academic and industrial research chemists. A sizeable 1998 external grant to fund fellowships has increased the number of enrolled underrepresented minority graduate students from an historical average of less than 3% to the present average of greater than 10%.

The impetus for Eyman's decision to step down at this time was the award of a substantial new grant supporting his research in catalysis studies related to fuel cells. Thus he returns to a faculty position in the Department, and has resumed his focus on teaching and research. All the Department wishes him every success in these endeavors.

Synthesis Labs Open for Business

The fifth floor renovation is nearly complete, and **David Wiemer** and **Jim Gloer** plan to move their research groups and offices there within the month. The renovation involved a complete overhaul of the southeast wing of CB on the 5th floor. The entire area was gutted right down to the walls and then new hoods, benches, casework, desks, utilities, and an air handling system were installed. The space was designed with extensive input from the prospective occupants, and should have a very positive impact on their research programs. In addition, the space being vacated will become available for new faculty hires. The project was funded by an NSF infrastructure grant and matching University funds.

More Chemistry Laboratories at IATL

Construction of new laboratories on the third floor of the Iowa Advanced Technology Laboratory (IATL) began in March of 2000. A suite of 14 laboratories that occupy a total of 11800 square feet will be built in this project,

and the space will be allocated on a 50:50 basis to the Department of Chemistry, College of Liberal Arts, and the Department of Chemical and Biochemical Engineering, College of Engineering. The research groups of Professors **Mark Arnold** and **Robert Linhardt** will occupy 2500 square feet of the new laboratory space when the project is completed in the spring of 2001. The remaining space that is allocated to the Department will be utilized to recruit new faculty and to allow productive research groups to grow. This 3rd floor IATL project provides our Department with much needed resources for these important purposes.

21st Century Frontiers

The Research Frontiers in Chemistry Program continues to bring noted chemists to the department. This year we were honored to have Professors **Kenneth N. Raymond** (University of California at Berkeley), **John D. Corbett** (Iowa State University), **Peter G. Wolynes** (University of Illinois), **Robert Bergman** (University of California at Berkeley), **Larry E. Overman** (University of California at Irvine), and **Richard Zare** (Stanford University). We were treated to many new and creative directions in chemistry.

Our tentative schedule for next next year includes Professors: **Malcolm Chisholm** (Department of Chemistry Ohio State University) week of September 4-8; **John Beercaw** (Department of Chemistry, California Institute of Technology) week of September 11-15; **Amos B. Smith**, (Department of Chemistry, University of Pennsylvania) November 8-10, 2000; **James Jorgenson** (Department of Chemistry, University of North Carolina at Chapel Hill) March 21-23, 2001; **Judith Klinman** (Department of Chemistry, University of California at Berkeley) and **James Anderson**, (Department of Chemistry, Harvard University) April 16-18, 2001.

The Frontiers series complements our departmental colloquia and divisional seminars. Let us know if you would like to be put on the mailing list.

Theoretical Chemistry Conference

The 33rd Midwest Theoretical Chemistry Conference held at the University of Iowa May 25-27, 2000 was organized by **Jan Jensen**. This

annual conference, which has never been held in Iowa City, typically attracts about 100 students and faculty members from the Midwest. The conference covers all areas of theoretical chemistry. It will feature two plenary lectures by Don Truhlar (University of Minnesota) and Mark Gordon (Iowa State University) as well as a varied mix of short presentations and posters from undergraduate and graduate students, postdocs, faculty, and corporate and government scientists. Traditionally the conference has been a forum for graduate students and postdocs to present their research and their participation is especially encouraged.

New Faculty

This next academic year we will experience an increase in the number of faculty. There are two no hires and no resignations or retirements.

Professor **Robert (Bob) Linhardt** joined the Department in September of 1999. Bob enjoys a unique 50:50 appointment that involves the Department of Chemistry in the College of Liberal Arts and the Division of Medicinal and Natural Products Chemistry in the College of Pharmacy. He brings to the Department an international reputation in the synthesis and structure-function studies of complex carbohydrates, as well as a much appreciated love of teaching organic chemistry. Bob also maintains a courtesy appointment in the Department of Chemical and Biochemical Engineering of the College of Engineering.

Leonard MacGillivray and **Jason Telford** will join the faculty as Assistant Professors in the upcoming academic year. **MacGillivray** received his Ph.D. degree in 1998 from the University of Missouri-Columbia, where he worked under the direction of Professor Jerry Atwood on host-guest chemistry and molecular recognition. He has incorporated these research interests into a program of synthetic design in the solid state as a Postdoctoral Associate at the Steacie Institute of Molecular Sciences of the National Research Council of Canada in Ottawa, Canada. Len intends to continue developing a broad-based program in synthetic organic and inorganic chemistry in the solid state after he joins the Department. His wife, Kate, will begin Law School at the University of Iowa in August.

Telford received his Ph.D. degree with Professor Ken Raymond at the University of California at

Berkeley in 1995, where he worked on synthesis of novel ligands that bind metal ions in ways that mimic siderophores. From 1996 to 1998 he was an NIH Postdoctoral Fellow in the laboratory of Professor Harry Gray at California Institute of Technology, where he studied the kinetics and thermodynamics of protein folding initiated by photoinduced electron transfer. Jason came to the Department in the fall of 1998 as a Visiting Assistant Professor, and since then has contributed effectively to teaching in our freshman program and in the graduate curriculum in inorganic chemistry. Jason is interested in *de novo* design of metalloproteins, in the development of molecular hosts for actinide anions, and in the mechanism of action of bacterial flagellar motors. Jason's wife, **Sonya Franklin**, has been in the Department as an Assistant Professor of Bioinorganic Chemistry since the fall of 1998.

Faculty Activity

Donald Burton has had another active year presenting keynote and invited lectures throughout the world. He has continued mentoring high school students; the total now exceeds 20. The program provides an opportunity for women and minority students to be exposed to 'real' science and to encourage an interest in a scientific career as a college student. He is batting 1000; all of the participants have attended college with a major in either science or engineering.

Vicki Grassian has been setting an active pace in environmental chemistry: both in research and undergraduate programs. In addition to initiating a chemical sciences "yellow" track in the environment science program she is actively collaborating with faculty outside of the Chemistry Department. She and Greg Carmichael (Chemical and Biochemical Engineering) have received money from the Engineering Directorate at NSF to support a Research Experience for Undergraduates (REU): "REU Site in Environmental Systems at The University of Iowa's Center for Global and Regional Environmental Research".

Johna Leddy's research group has continued to enhance fuel cell efficiency with the development of low temperature hydrogen/oxygen and hydrogen/air magnetically modified fuel cells. Their work on the impact of magnetic modification on electrochemical

systems has resulted in four patents in 1999. Coworkers for these patents include: **Sudath Amarasinghe**, **Lois Anne Zook** and **Flavio Tinoco**. Titles were: "Gradient Interface Magnetic Composites and Methods Therefor", "Magnetic Composites and Methods for Improved Electrolysis", "Fuel Cells Incorporating Magnetic Composites Having Distinct Flux Properties" and "Magnetic Composites for Improved Electrolysis". Keep in mind they are also working on a better breathalyzer using small electrochemical cells to measure the blood alcohol level based on the alcohol content of the exhaled breathe.

This past year **Vasu Nair** chaired a Gordon Conference on Purines, Pyrimidines and Related Substances and received the University of Iowa Collegiate Teaching Award for Undergraduate and Graduate Teaching and Research Training of Graduate Students.

Visiting Faculty Update

After four years of teaching in our Department and commuting from Muscatine **Lisa Fields** will be putting the textbooks away and become a full-time mom leaving and starting a family. Lisa has been a member our visiting faculty since the fall of 1996. She taught a variety of courses: Technology and Society, Organic II and Advanced Organic. We have enjoyed having Lisa as a member of the Department and wish her the best in her future endeavors.

Peter Hansen joined the faculty as a Visiting Professor in the fall semester of 1999, and team-taught Principles of Chemistry I with erstwhile Chairman **Darrell Eyman**. Peter, a Ph.D. graduate of Iowa State University in 1966, taught at Northwestern College in Orange, Iowa, for 30 years and served as department chair there for nine years. He brings valuable experience to our freshman chemistry teaching program. Welcome Peter!

Dr. **Christopher Coretsopoulos** (University of Illinois), Dr. **Doris Eckey** (University of Minnesota), Dr. **Russell Larsen** (Harvard University) and Dr. **Timothy Smith** (University of California-Berkeley), continue to provide important contributions to our freshman and sophomore courses.

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.

State-of-the-Art CCD Single-Crystal X-Ray Diffractometer

The Department of Chemistry has recently received a \$275,000 award from the Roy J. Carver Charitable Trust (Muscatine, Iowa), for the purchase of a CCD area detector X-ray diffractometer for molecular structure determination, based on a proposal written by **Lou Messerle**. This diffractometer can routinely collect the entire diffraction data set for a single crystal in several hours, versus the 1-2 weeks common for single-point detector diffractometers. The CCD diffractometer collects an area of diffraction data by placing a large area CCD detector directly behind an X-ray phosphorescent screen so that many reflections are collected simultaneously. The Department is pleased to receive this competitive award because it will help modernize the X-ray Facility and allow faculty and students to study small crystals that cannot be studied with our present equipment. Also, the new diffractometer will support the research of our newest faculty member, Prof. **Leonard MacGillivray**, who joins the Department this fall. Prof. MacGillivray will be studying solid-state photochemical synthesis without the use of solvents (also known as "green chemistry" because it minimizes the use of environmentally noxious organic solvents), and rapid single crystal diffraction is essential to his research. The new CCD diffractometer will join our two Nonius CAD-4 diffractometers (*ca.* 1986, purchased with National Science Foundation funding) and a Siemens D5000 automated powder diffractometer (*ca.* 1994) in the Department's X-ray Facility. The diffractometer will support small-molecule crystallography needs for researchers in a wide range of University departments (Chemistry, Pharmacy, Medicinal Chemistry, Biochemistry, Physics), for researchers in the Iowa City Veterans Administration Hospital, and for several small companies in Iowa. In addition, the Department will provide several free structure determinations to six four-year colleges in eastern Iowa and western Illinois in order to broaden the research

opportunities available to their faculty and undergraduates.

Chemistry Library is E-accessible!

The prices of journals and books has escalated tremendously in the past decade and since the budget has not kept up with these increases, the number of subscriptions and acquisitions has been reduced. However, faculty and students can do rapid literature searches in the library and in their offices. Many of the latest journal issues can be instantly downloaded right to a desktop printer; this includes all ACS publications!

Graduate Students

This past year our number of graduate students remained steady at 88. Our graduate students remain very busy doing research, studying and presenting papers at local and national meetings.

There were 10 Masters degrees awarded to (advisor's name in parenthesis): **Muhsin Ezer** (Simenonsson), **Xiaobang Gao** (Burton), **Kevin Helwig** (Wiemer), **Michele Nuckols** (Nair), **Lynne Remer** (Jensen), **Kristen Rowell** (Jordan), **Catherine Spolar** (Leddy), **Yu Sun** (Arnold), **Bo Xie** (Gloer) and **Hong Zhang** (Arnold).

13 PhDs awarded in Chemistry. Here is a listing of the new PhDs that were directed by faculty in the Chemistry Department; their advisors and Dissertation titles are enclosed in parenthesis.

Steve Carlo (Grassian: Temperature Programmed Desorption and Reflection Absorption Infrared Studies of Photoinduced Polymer Film Formation and Degradation and Hydrogen Bromide Ice Systems in Ultra High Vacuum), **Yongsheng Che** (Gloer: Chemical Investigations of Mycoparasitic and Coprophilous Fungi), **Ta-Yung Chen** (Leddy: Electrochemical Studies of Nafion Composites), **Jahoon Choe** (Linhardt: Affinity-Based Reversed Micellar Liquid-Liquid Extraction of Proteins), **Sam Dagorne** (Jordan, Stereoselective Propene Insertion Reaction of Chiral Zirconocenes and Synthesis and Structures of Neutral and Cationic Amidinate Aluminum and Gallium Complexes), **Sara Hein** (Gloer: Chemical Investigations of Bioactive Metabolites from Antagonistic Fungi), **Anna W. Helwig** (Arnold: A New Selectivity Determination of Aqueous Glucose), **Biren**

Joshi (Gloer: New Bioactive Natural Products from Coprophilous and Mycoparasitic Fungi), **LoriAnn Lentsch** (Wiemer: Nucleophilic Additions to β -keto Phosphonates), **Rohit Medhekar** (Quinn: Molecular Recognition and Structure-Activity Relationships for Serine Hydrolases), **Elango S. Minnoor** (Pietrzyk: Applications of Modified Fused Silica Capillaries in Capillary Zone Electrophoresis), **Ashish Soman** (Gloer: Chemical Investigations of *Chaetomium globosum* and Mycoparasitic and Coprophilous Fungi), **Dan Swart** (Simeonsson, Laser-Induced Fluorescence Spectrometry Techniques for the Trace Determination of Selenium and Arsenic), **Craig A. Wesolowski** (Burton: Stereospecific Palladium-Catalyzed Carbon-Carbon Bond Forming Reactions of 1,2-Difluorovinyl Halides and 1,2-Difluorovinyl Organometallic Reagents), **Michael W. Wolff** (Linhardt: Extension of the Glycoprotein Processing Capabilities of the Lepidoteran Insect Cell Line *Spodoptera Frugiperda* by Metabolic Engineering).

8 GAANN Students in Chemistry

The GAANN programs (Graduate Assistance in Areas of National Need) is intended to support fellowships for under-represented minorities who would like to pursue a PhD degree in Chemistry and to encourage them to consider academic careers. Recipients of the GAANN award are: **Eric Bonsu, Shonda Monette, Elisha Pendleton, Alfred Wooten, Joel Welsh, Conrad Jones, and Kinesha Harris**. The program 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.

Undergraduate Students

Our number of undergraduate chemistry majors increased from 85 to 87. This spring we had 37 seniors, 21 juniors, 12 sophomores and 17 freshman. In 1999 there were 15 chemistry majors who graduated; 4 with the BA and 11 with the BS degrees. Many of our undergraduate majors are associated with a research group and have the joy of doing research. **Mike Kammerer** (Sonya Franklin advisor) won the Minnesota Chromatography Forum Award for Undergraduate Research, and received a check for \$2500. 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 year's recipients were:

sophomore: **Soshannah Roth**
junior: **Parisa Taravati** and **Stephen Maldonado**
senior: **Ali Djalali** and **Katherine Lindstrom**

The Merck award was received by **Kirk Perreau** while the Russell K. Simms Scholarships were earned by: **Suzanne Block, Ali Djalali, Michael Kammerer, Melissa Kruse, Ryan Minikis, Farid Moussavi-Harami, Kirk Perreau** and **Parisa Taravati**. The American Institute of Chemists awards was received by **Kristi Oberbroeckling** while the Analytical Chemistry Award went to **Stephen Maldonado**. The Robert W. and Gertrude Kick Leeper Junior Scholar Award was received by **Ryan Minikis** and **Farid Moussavi-Harami**.

Research and Visiting Scientists and Postdoctoral Associates

In addition to undergraduate and graduate students, many research groups have major contributions from research and visiting scientists and postdoctoral associates.

A list of the research and visiting scientists, their home institutions, sponsors and projects are as follows:

Dr. **Airat Amerov** of Kiev State University (Ukraine) is working with Dr. Arnold on "Characterization of Kromoscopy for Noninvasive Blood Glucose Sensing". Dr. **Masafumi Kobayashi** from Kanto Denka Kagyo Co. Ltd. (Japan) worked with Professor Burton on "Fluorine Chemistry". Dr. **Angela Regina Araujo** of the Instituto de Química, UNESP (Brazil), is working with Professor Gloer on "Bioactive Metabolites from Freshwater Aquatic Fungi". Working with Professor Grassian during the summer was Dr. **Mohamed El-Maazawi** from the UAE University (United Arab Emirates) on "Photocatalytic Oxidation on Titanium Dioxide Surfaces: An In-Situ Transmission FT-IR Study". Dr. **Shin Jyung Kang** from Joongbu University (South Korea) is working with Professor Larsen on "Photodegradation of Volatile Organic Compounds on Titanium Dioxide and Zeolites". In Professor Linhardt's research group, Professor **Guangli Yu** of Ocean

University of Qingdao (China) is working on "Preparation and Structural Characterization of Heparin Oligosaccharides". Professor **Mamoru Koketsu** of Gifu University (Japan) is working on the "Synthesis of C-Glycosides of Ulosonic Acids". Dr. **Hyun-Ok Yang** of Asan Natural Products Institute (Korea) worked on "Preparation and Structural Characterization of Dermatan Sulfate Oligosaccharides". In Professor Nair's research group, Dr. **Suresh Pal** from Kurukshetra University (India) is working on the "Enzymology of Nucleosides and Nucleotides with Cloned Human Enzymes". Professor **Guisen Zhao** of Chan Dong Medical University (PRC) worked on "Isonucleosides as Inhibitors of HIV Replication". Professor **Kang-Yeoun Jung** of Kangnung National University (Korea) is working with Professor Wiemer on the "Synthesis of Nucleoside Phosphonates".

A list of the postdoctoral associates, their sponsors and projects they are working on follows:

Bindu Ravindran Bera (Nair: Antiviral Nucleosides with Novel Sugar Scaffolds), **Sanjib Bera** (Nair: Conceptually Novel Inhibitors of HIV Reverse Transcriptase), **Arezki Boudif** (Goff: Synthesis of Lactoperoxidase Heme Models), **Byoung-Kwon Chun** (Nair: Novel Isomeric Nucleosides: Inhibitors of HIV Replication), **Hachull Chung** (Leddy: Magnetically Modified Fuel Cells), **Holger Glatzer** (Eyman: Catalytic Hydrocarbon Processing), **Luke Grocholl** (Gillan: Synthesis of Organometallic Group 13 Compounds and Solvothermal Synthesis of Group 13 Nitrides), **Mariá Hernàiz** (Linhardt: Protein Carbohydrate Interaction), **Ulrich Hoeller** (Gloer: Antiparasitic and Antiinsectan Compounds from Mycoparasitic Fungi), **Barry Hu** (Arnold: Noninvasive Protein Monitoring with Near Infrared Spectroscopy), **Visvaldas Kairys** (Jensen: Treatment of Covalent Boundaries in QM/MM Methods), **Troy Kleckley** (Wiemer: Synthesis of Farnesol Analogues by Metal-Mediated Couplings), **Vladimir Kolesnichenko** (Messerle: Metal Cluster Synthesis), **Laurie LeBrun** (Linhardt: Protein-Carbohydrate Interaction), **Ping Li** (Grassian: Heterogeneous Reactions of Volatile Organic Compounds on Mineral Dust and Mineral Oxide Surfaces), **Naozumi Nishizono** (Nair: Aminoglycosides as Potential Inhibitors of HIV Replication), **John Olesberg** (Arnold: Noninvasive Protein Monitoring with Near Infrared Spectroscopy), **Allen Ontko** (Eyman: Radical Chain Reactions

of η^5 -Cyclohexadienylmanganese Species with Halocarbons), **Alexander Panov** (Grassian/Larsen: Selective Photooxidation Reactions in Zeolites), **Debasis Patra** (Totah: 1,7-Dioxaspiro[5.5]undecanes as Chiral Ligands for Asymmetric Transformations), **Peter Schebler** (Messerle: Metal Cluster Coordination Chemistry), **Byung Ick Seo** (Nair: Synthesis of Inhibitors of HIV Integrase), **Punit Seth** (Totah: Studies Toward the Synthesis of Phomactin A), **Pawan Sharma** (Nair: Synergistic Inhibitors of HIV Infectivity), **Michael Taktakishvili** (Nair: Novel Model DNA Systems: Biophysical Studies and Inhibition of Wild Type Recombinant HIV-1 Integrase), **Grant Underwood** (Grassian: Heterogeneous Reactions of Nitrogen Oxides on Mineral Dust and Mineral Oxide Surfaces), **Jianjun Wang** (Gillan: Synthesis and Properties of Carbon Nitride Powders and Films), **Zhi-Yang Xue** (Eyman: Catalytic Hydrocarbon Processing), **Fuming Zhang** (Linhardt: Metabolic Engineering of Insect Cell Glycoprotein Glycans).

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

Laboratory Courses for our Chem Majors

This year we are focusing on the senior level lab courses. A combination of support from the University, your donations to the Chemistry Department thru the University of Iowa Foundation and the student laboratory fees have provided us the resources to make substantial changes in our laboratory courses.

These lab courses provide a strong foundation for our undergraduate majors whether they start working in the chemical industry or pursue advanced education. You can see and appreciate the valuable experience our students are gaining by using modern equipment.

Inorganic Chemistry Laboratory

This laboratory course taught by **Lou Messerle** is designed to acquaint junior and senior chemistry majors with advanced synthetic chemical and spectroscopic characterization techniques applicable to inorganic chemistry, organometallic chemistry, materials synthesis, solid-state chemistry, and organic chemistry.

The techniques that are experienced in hands-

on fashion include: use of Chemical Abstracts in determining an optimized synthesis of a compound, glassblowing, tube furnace syntheses, sol-gel synthetic approaches, glove bag use, glove box use, Schlenk line use, inert-atmosphere techniques (including the establishment of an inert atmosphere in glassware at the benchtop, cannula transfer of liquids, filtration of air-sensitive solutions), sublimation, Soxhlet extraction, mechanical stirring, drying of heated solids under vacuum, advanced approaches to recrystallization, and rotary evaporation. The emphasized spectroscopic techniques, some done in hands-on fashion and with an emphasis on the practical aspects, are multinuclear high field FT NMR spectroscopy, polarimetry, FT-IR spectroscopy, mass spectrometry, and single-crystal X-ray diffraction.

The sequence of experiments last fall was (1) two weeks of glassblowing, culminating in the construction of a glass bubbler with ring seal, (2) preparation of the octahedral, hexanuclear cluster $(\text{H}_3\text{O})_2\text{W}_6\text{Cl}_{14}$ by tube furnace solid-state synthesis, (3) preparation of the high temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ by sol-gel methods, (4) preparation of enantiomeric and diastereomeric Co coordination complexes, (4) preparation of the organotin compounds $\text{Sn}(\text{CH}_2\text{Ph})_3\text{Cl}$ and $\text{Sn}(\text{CH}_2\text{Ph})_4$, and (5) preparation of a number of cyclopentadienyl, arene, dinuclear metal-metal bonded, and tropylium derivatives of $\text{Mo}(\text{CO})_6$. The previous year an experiment in ruthenium alkylidene-catalyzed ring-opening metathesis polymerization (ROMP) of an oxanorbornene was performed as an introduction to both polymer and metal alkylidene chemistry.

One highlight of the course is the testing of student superconducting pellets for the Meissner effect, in which a superconductor at liquid nitrogen temperature levitates a small permanent magnet; the competition is termed the "Iowa City Fly-Off Contest". The students are provided with a diverse array of metal carbonates and nitrates and, after reading literature on reserve in the Chemistry Library, attempt to make a new high temperature superconductor. The entrepreneurship is palpable as students are promised an A+ grade for the course for discovering a new, reproducibly synthesized superconductor! Last fall, a new experiment was introduced in which students tested a new synthetic route to a known metal cluster compound, $(\text{H}_3\text{O})_2\text{Mo}_6\text{Cl}_{14}$. All 17 students in the course will be coauthors on the resulting

literature paper in preparation.

Physical Measurements Laboratory

Mark Young has been implementing many changes in the Physical Measurements Laboratory in the last couple of years.

All of our conventional spectroscopic instruments are recent additions and include a diode array UV/Vis spectrometer, a spectrofluorimeter, and a Fourier-transform infrared spectrometer. A number of new experiments have been added as a result of having access to these spectrometers. For instance, the students measure the absorption spectra of a series of dye molecules and examine how the observed absorption wavelengths can be described with a particle-in-a-box model (many former chemistry majors will likely have fond memories of the particle-in-a-box). The spectrofluorimeter is used to monitor the formation of a pyrene excimer as a function of temperature.

In addition to conventional instrumentation, we have also been fortunate to be able to acquire some more cutting-edge type equipment that really sets our laboratory apart from similar teaching laboratories at other colleges. We purchased a scanning tunneling microscope (STM) only a few years after the Nobel Prize was awarded to the scientists that developed this revolutionary microscopy technique. Students use the amazing resolution of the STM to obtain images of single atoms (carbon atoms in a sample of graphite, in this case) and to look at long chain hydrocarbons adsorbed onto surfaces. The STM is not a turn-key experiment and students must have some patience to acquire good quality images but the reward is an actual picture of the elusive atom that they have heard so much about in their undergraduate courses.

Most recently, we have added a complete laser system which includes a nitrogen laser, a tunable dye laser and a sample compartment equipped with a monochromator and detector. While lasers are becoming more prevalent in industrial and academic laboratories and are common in commercial applications, Iowa is one of the few institutions to introduce laser technology into the undergraduate laboratory. The fast time resolution of the laser system, approximately 10^{-9} seconds (a nanosecond), will allow our students to make very detailed studies of chemical reactions.

Each of our new instruments is connected to a computer to control the equipment and to collect the data. The computers are tied to the

University's ethernet network, which was recently upgraded in all of the Department's teaching space. Students now have the luxury of accessing their data from any remote location on the network, such as from a dormitory room or from our Undergraduate Computer Facility. In recognition of the impact computer based technology has had on chemistry, one of the experiments in Physical Measurements consists of a computational experiment where students use recently created software to theoretically model some type of chemical reaction. As an added advantage, this experiment can be performed in shorts and sandals and instead of goggles, students can use colored glasses to view 3-D images of their computational results.

We anticipate adding even more new experimental equipment so that students exposure to modern laboratory methods will only expand in the coming years.

Staff Update

Since the last Newsletter we have had some staff changes. **Janet McCune** has moved from the front office to the Chemistry Center where her primary function is graduate student recruiting and admissions. She was replaced in the front office by **Courtney Bork**, who previously served as secretary in the Business Office of the University of Iowa Hospitals and Clinics. Courtney is serving as Secretary to the Chair, as well as providing staff assistance to faculty and students on numerous issues that are related to academic programs and personnel policies. We welcome Courtney to the Department.

Jeff Reuter keeps our computers running and free of bugs. Although he is employed by Information Systems in the College of Liberal Arts his office is in the Chemistry Building. He started serving Chemistry in September by upgrading computers and our local ChemNet. He has helped us become Y2K compliant and has saved us from major viruses, e.g. ILOVEYOU! Jeff is kept busy by the 160 computers in Chemistry and more than 120 computers in Geostudies and Social Work. He still finds time to be an active father for his two sons and engage in their activities.

Dr. **Donald Stec** joined us in February as the Departmental NMR Specialist. He received the Ph.D. in Chemistry from the University of South Carolina, and conducted part of his thesis

research at Batelle Labs. Don also has postdoctoral experience at Stanford University and most recently at Argonne National Lab. He has particular expertise in solid state NMR, component fabrication, and gradient spectroscopy. Don is an avid fisherman, and he is attracted to area lakes and streams. However, the Iowa bass, walleye, crappie, and catfish need not fear, as Don follows a catch-and-release philosophy.

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 you may either email us at

chemdept@uiowa.edu

or surf the web at

<http://www.uiowa.edu/~chemdept/alumni>.

Let us know if you want your name, address, etc. to be kept private.

This year our response rate was down from previous years so we are trying something new. You will note the attached page that you can fill in and return. It should only take a few minutes of your time and it would be greatly appreciated. So please give us a note!

Some of this year's responses follow. One graduate suggests that our graduate program should have "more integration of the traditional disciplines of chemistry". Good scientists need an "understanding of preparations, purification techniques, molecular identification and quantification and physical properties". The importance of computer literacy, writing/communications and interpersonal skills should also receive more emphasis. It was suggested that topics such as combinatorial chemistry, validation procedures and regulatory frameworks would be beneficial for the contemporary graduate.

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.

Why don't you visit our Department this year.