ChemLetter

Summer/Fall 2002 • Volume XXIV • No. 1

Dear Alumni and Friends:

One year ago, the Nisqually earthquake was the prior year's most memorable event. During the past year, it was the tragedies of September 11, 2001, that shook us deeply. The horror of that day and the days that followed lead me to reflect in this message on the many positive things that happened in Chemistry at UW this year.

The baby boom echo continues to increase undergraduate demand for chemistry classes. A record 3000 freshmen joined us for coursework this year. Our faculty, staff, and teaching assistants deserve special thanks for smoothly accommodating this large group. Over 150 undergraduate students earned bachelor degrees this year in our Chemistry or Biochemistry programs. Many of these students enjoyed intense individual research experiences along the way. These students will now take on graduate or professional school or join the nation's workforce. We are proud of them and of our contribution to their education.

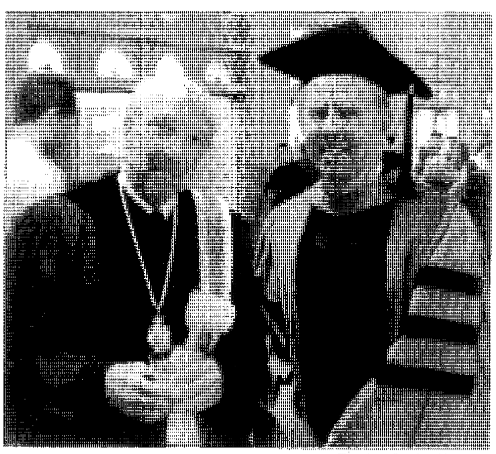

Photo Andy Kwong

1992 Nobel Laureate Edmond H. Fischer and Chairman Paul Hopkins at the 2002 Chemistry Commencement. *Story, page 9.*

The graduate program remains strong. The largest class of incoming graduate students in our history, a total of 52, joined us last fall. These students completed first year coursework and have now identified thesis mentors. Their research projects are underway. At the other end of the process, some 25 students earned the Ph.D. with us this past year. Some of these students elect to go on to postdoctoral positions; some join the workforce directly. Despite a sluggish economy, they are finding suitable employment.

This past fall, two new faculty members and their co-workers joined us. Professor Pradipsinh Rathod and his students moved from Catholic University. Pradip's program aims to combat malaria, a disease responsible for enormous human suffering and mortality, by exploiting biochemical peculiarities of this parasite. His latest work was published in the highly prestigious journal *Science*. Professor Gabriele Varani and his students moved from the Medical Research Centre in Cambridge, England, to join us. They will study the structure and dynamics of ribonucleic acids and their complexes with proteins using primarily the tool of nuclear magnetic resonance spectroscopy.

Another honor is due the Department soon. In August, Professor Dalton and faculty and student colleagues at this university and others will launch an NSF-funded Center on Materials and Devices for Information Technology Research. These scientists will pursue the design, synthesis, and incorporation into devices of novel materials that handle optical signals, critical components of photonic devices that many believe will revolutionize computing and telecommunications. The full story is described on page 12.

The departure last year of Gary Pedersen and Jane Meredith from our front office and their replacement with Sharon Minton and Aileen Trilles brought the opportunity to rethink the distribution among our staff of the many jobs they do to support the teaching and research programs. Many of our staff have accepted new tasks. Change is always stressful in an organization, and our situation has been no different. I thank the staff for their flexibility and willingness to work through these changes. We have emerged a stronger organization.

Our excellent progress comes despite further erosion of the state funding intended to support the instructional program. Olympia dealt UW a 5% cut in state funding for the coming fiscal year, resulting in no salary increase for our faculty and staff. Because they will see increases in the cost of their health care, a pay cut is the true outcome. This story is not exceptional among the many states facing budget shortfalls. What distinguishes us is that UW started from a position of financial

continued on page 7

Published by the
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109 Bagley Hall
Seattle, WA 98195-1700

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In This Issue

The Gamelin Research Group

By Professor Daniel Gamelin

Our research focuses on the combined use of synthesis, spectroscopy, and reactivity studies to address structure/function relationships in inorganic materials and coordination complexes. We use various complementary spectroscopic and magnetic techniques including electronic absorption, luminescence, magnetic circular dichroism, electron paramagnetic resonance, and resonance Raman spectroscopies, applied at various temperatures and/or magnetic field strengths, to probe the properties of these materials. Experimental spectroscopic results are analyzed to provide descriptions of the electronic structures and bonding interactions of these systems, from which insight into their functional properties may be deduced. This research combines innovations in chemical preparative methodologies with physical investigations involving sophisticated spectroscopic and magnetic instrumentation, and provides students with advanced training in various topics of materials, inorganic, bioinorganic, and physical chemistries.

Photo Mary Levin

One area in which we are actively involved is the synthesis and spectroscopy of nanoscale semiconductor materials containing small amounts of transition metal or rare earth metal impurities. When the impurities are paramagnetic, these are often referred to as diluted magnetic semiconductors (DMSs). DMSs are currently the focus of intense applications-oriented research. Recent advances forecast a transition from traditional charge-based electronics to faster and more energy efficient spin-based electronics (*"spintronics"*) technologies by use of electron spins, in addition to charges, to transmit information.

Nanoscale DMSs in the form of quantum dots, quantum wells, or quantum wires are key architectural elements in many proposed spintronics devices. Interest in nanoscale DMSs has also been fueled by recent proposals for their use in quantum computing as individual "qubits" and in quantized magnetic disks. Although the properties of pure semiconductors are known to change dramatically when their dimensions are reduced to the nanometer size scale, little is yet known about the properties of DMSs on this size scale. It is of fundamental and technological importance to understand how the properties of this class of materials change when quantum size effects become important. In order to study such effects, it is necessary first to be able to make such materials, and additionally to apply appropriate methods for studying them.

We currently are developing new solution-based approaches for the preparation of novel magnetic nanocrystalline oxide and chalcogenide semiconductors. Our spectroscopic methods are then applied as analytical tools for the refinement of preparative methodologies, and as detailed probes of magnetic, electronic, and magneto-optical properties of the materials we prepare. This research emphasizes the development of fundamental insight into the physical and chemical properties of these materials. Once prepared, however, these materials may find application in the areas of magneto-optical memory, nanoscale electronics, optical imaging, and heterogeneous catalysis among others.

A second area of research interest is investigation of transition-metal mediated DNA strand cleavage reactions involving high-valent metal ions, using both chemical and spectroscopic methods of analysis. There is growing interest in the employment of transition-metal coordination complexes to perform controlled redox reactions in the field of molecular biology. The carcinogenicity of some metal ions is also believed to relate to the oxidative chemistry they display when bound to naturally occurring metal binding proteins.

Our experiments focus on the use of synthesis, spectroscopy, and reactivity studies of small molecule transition-metal analogs to identify relevant reactive intermediates that may be involved in biologically relevant oxidative DNA reactions. Identification and description of such intermediates will lead to a deeper understanding of the origins of their reactivity, and how it may be controlled and/or applied.

Finding His Niche

The Department is pleased to introduce Assistant Professor Daniel Gamelin. Dr. Gamelin joined the faculty in March of 2000 after declining offers from other prestigious universities. UW presented an irresistible combination: state-of-the-art facilities, supportive attitude toward research, and beautiful location.

Daniel's only serious reservation about UW was its size. How can you offer personal attention to students in such a huge system? He was concerned for the freshman chemistry students, who take survey courses with 200-300 others. He soon discovered, however, that the advantage of a large university is the number of choices available compared to those at smaller schools.

"At Reed, if I wanted to pursue a science major, my options were Math, Physics, Biology, or Chemistry. There were few courses offered in the subdisciplines and relatively few research opportunities." Once he realized the depth and breadth of opportunity UW offers, *because of* its size, he turned his attention toward developing ways to engage his students.

He invites undergraduates to work in his lab and takes great pride in their accomplishments. To break down inhibitions caused by large class size, he stages impromptu demonstrations designed to encourage questions. "Nothing gets student attention and ensures participation like a good explosion," he laughs.

Dr. Gamelin's research focuses on spectroscopy of inorganic molecules and materials. His work quickly attracted four graduate students, who describe him as a natural teacher and "one of the kindest people" they've ever met. Daniel, in turn, truly enjoys collaborating with his students. "I learn so much from them," he explains. "My students give me an excuse to discuss what I'm already interested in."

After receiving his B.S. from Reed, Daniel took a pre-doctoral position in Germany. He earned his Ph.D. at Stanford with Prof. Edward Solomon, a preeminent practitioner of inorganic electronic spectroscopy. He then accepted another European research position, this time as a post-doc at the University of Bern in Switzerland with Prof. Hans Güdel, another leading inorganic spectroscopist.

Dr. Gamelin has published numerous papers and is actively involved with UW's Center for Nanotechnology and the UW/PNNL Joint Institute for Nanoscience.

UW Welcomes "Unsung Hero"

BY RYAN LUCE

In February of 2001, a mere month after Professor Norm Dovichi officially moved his research group to the University of Washington Chemistry Department, Seattle was in the midst of a typically miserable late winter drizzle. Unlike the majority of our city's inhabitants, Dovichi claims that he and his wife were enjoying the weather. After 14 years as a professor at the University of Alberta in Edmonton, he says of Seattle's rainy winters that he'll "take this over minus 40 any day."

An analytical chemist who specializes in detection of biological materials, Dovichi and his research group in Edmonton were the co-inventors of the gene sequencer used in the Human Genome Project. (The other party involved was the Hitachi Ltd. Corporation in Tokyo.) The gene sequencers are based on methodology that uses fluorescence detection and capillary gel electrophoresis. This methodology allows for high-throughput and a minimum of sample when sequencing the DNA. These gene sequencers did the majority of the work for both the public and private sequencing efforts. For this contribution, *Science* magazine labeled Dovichi one of the "Unsung Heroes" of the Human Genome Project, the only chemist to be so mentioned.

A native of Chicago, Dovichi received B.S. degrees in chemistry and mathematics from Northern Illinois University in 1976. He earned his Ph.D. in physical/analytical chemistry under the tutelage of Joel Harris at the University of Utah, specializing in thermal lens calorimetry. After completing a post-doctoral fellowship at Los Alamos Scientific Laboratory with Dick Keller and a 5-year stint as a professor at the University of Wyoming, he moved to the University of Alberta in 1986. Ironically, shortly after he accepted an offer from the University of Alberta but prior to his actual moving there, Professor Gary Christian attempted to recruit him to join the UW Department of Chemistry. Dovichi had already committed to Alberta, however, and would wait another 14 years before moving to the Pacific Northwest. The Department made another pitch to Dovichi after he gave a very well received seminar at UW in 1999.

Dovichi now holds the Endowed Professorship of Analytical Chemistry at the University of Washington and also has been appointed an Affiliate Professor at the Institute for Systems Biology. (The Institute of Systems Biology is also located in Seattle; one of its founders is Leroy Hood, formerly of the University of Washington.)

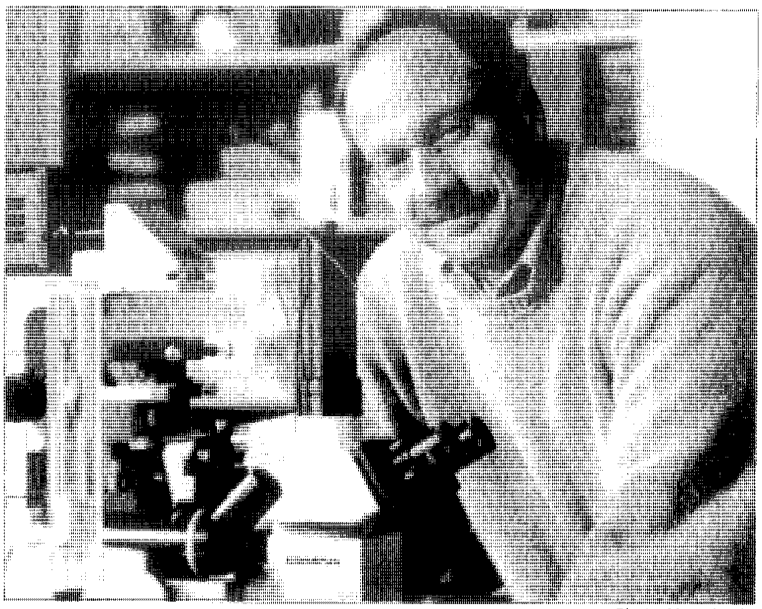

Photo Mary Levin

Although there were obvious weather-related motivations for Dovichi moving his research group to Seattle, the main reason he was interested in UW was the numerous research opportunities it would offer. He wanted a university with a strong analytical chemistry division and medical school, as well as a region that might present opportunities for partnerships with researchers at other institutions.

To Dovichi's delight, the decision to relocate is already paying dividends. Although he has only been at UW for 18 months, he has current or potential partners in projects in many fields, including virology, oncology, and stem-cell research. These partners are at both the university and Fred Hutchison Cancer Research Center.

Dovichi's dance card is full for a reason. Since pioneering the DNA sequencing methodology, he has built upon these techniques to develop technologies that sense extraordinarily small amounts of biological materials. Dovichi and his research group are now able to detect quantities as small as a single analyte. More specifically, he and his group can detect the various proteins that are contained within a single cell. This extraordinarily sensitive technique, which Dovichi has termed "chemical cytometry," can be very valuable to researchers in a variety of biological fields.

One specific example on how "chemical cytometry" can be used is in the field of cancer research. Any tumor that presents clinically has a high degree of heterogeneity in its cells. The original cells that caused the tumor mutate rapidly, yielding daughter cells that may be very different in their composition. While the average characteristics of the cancer can be examined by current techniques, researchers would love to have the opportunity to see exactly what is going on at the different steps of this lineage.

Dovichi's ability to analyze a single cell allows analysis at each point along this path, yielding complete identification of all the proteins expressed at each step. There are analogous utilities in the path between stem cells and the differentiated cells, as well as the heterogeneous cells that comprise the immune system.

When asked about the unique contribution an analytical chemist can make to the field of biological research, Dovichi emphasizes the ability to provide a "bridge between basic science and engineering." By understanding the molecular biology research, as well as the physics, math, and chemistry that are the basis of developing new analytical techniques, Dovichi is able to push the frontier of what can be explored by biological researchers.

Despite an obviously busy research schedule, Dovichi is chiefly enthusiastic about the opportunity to educate and work with his students. In fact, he claims that the most rewarding aspect of his job is "working with the kids." His enjoyment at developing these exciting technologies in the company of eager new students is readily apparent. In fact, he seems enthusiastic about nearly all aspects of his research here in Seattle, even gray February days when it's 40 degrees and raining.

Donations fund vital Departmental activities, such as fellowships, scholarships, recruiting, and research symposia.

The following individuals, corporations, and foundations donated to the Department of Chemistry between July 1, 2000 and December 31, 2001. Chairman Paul B. Hopkins expresses appreciation on behalf of the Department for the generous support of all its donors. He urges people to call him at 206/543-1613 or email him at chair@chem.washington.edu if any gifts were omitted from this list or if names have been inadvertently misspelled.

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Graduate Student Awarded Prestigious Fellowship

This spring, second year graduate student Claire O'Neal was awarded a coveted Howard Hughes Medical Institute Pre-Doctoral Fellowship in Biological Sciences. The HHMI Fellowship will provide Claire with five years of graduate student support, including a yearly stipend, tuition support, and an allowance for related expenses such as books, journal subscriptions, and conference attendance.

Claire comes to UW from Indiana University where she received bachelor's degrees in English and Biology. Originally drawn to the liberal arts, Claire took a biology class in order to fulfill the requirements for her English degree. "I didn't hate the first biology class, so I took another," she explains. "I liked the second one so much, I took a third. I loved the third one so much, I taught it for four semesters." Claire then began studying organic chemistry out of a desire to understand biology on a molecular level. She became especially intrigued with the insight that protein structures gave her into protein function, an invaluable tool when investigating uncharacterized proteins. "If you know that a fold on one protein contacts DNA, and another protein has a similar fold, then there's a good chance that the fold on the second protein also contacts DNA."

In Wim Hol's structural biology lab, which she joined last year, Claire found a group of kindred spirits studying the relationship between structure and function. She currently is attempting to characterize the mechanism of cholera toxin using structural studies, and hopes soon to target proteins in the apicoplast of malarial parasites for structure-based drug design. She looks forward to a future career in the structural study of disease-related proteins and is particularly interested in cancer research and drug development.

Congratulations, Claire!


Photo Kathy Sauber

Deconstructing Chemistry

By Ryan Luce

Science has become such a high-tech, math-intensive discipline that many students, even those keenly interested in scientific theories, are too intimidated to try. A "liberal arts" education, once synonymous with "well-rounded," now tends to emphasize the arts and language with the sciences considered a necessary evil. In this climate, it is particularly surprising and refreshing when a liberal arts student pursues a course of study outside the safe routes proscribed by the modern liberal arts curriculum. One of Chemistry's most recent graduates chose to do just that.

Christopher Eide will earn bachelor's degrees in both Chemistry and Philosophy in the summer of 2002. With ultimate plans to become a Professor of English, Chris chose to pursue a B.S. in Chemistry as an intellectual challenge. Self-admittedly not a "lab-type person," Chris found a novel way to improve his analytical skills, which he feels will assist him in any future course of study.

This past year, Chris spent a great deal of time pondering nature's chemical and philosophical mysteries with Professor Nicholas Epiotis. Chris first met Professor Epiotis in one of his favorite classes—organic chemistry. After that meeting, he began his undergraduate research, but it was not the typical experience. Instead of working directly in the lab, he spent most of his time reading a variety of metaphysical and chemical literature and discussing it with Professor Epiotis. Chris used this as a basis to write a series of essays on "post-structuralist thinkers" and how their ideas can be analyzed from the viewpoint of physical science. He explains that he is "taking philosophical arguments and putting them in chemical language."


Photo Andy Kwong

Though he does not intend to pursue a career in the sciences, Chris nonetheless was extremely active in the chemistry undergraduate community. He served as a chemistry tutor, worked in the study center, engaged in community outreach activities designed to get children excited about learning science, and was elected as president of both the Free Radicals (Chemistry/Biochemistry Club) and Phi Lambda Upsilon (Chemical Honors Society). He also helped begin the process of developing an Alpha Chi Sigma chapter at the University of Washington. He hopes that this new chapter of the national chemistry fraternity will facilitate more interaction and networking between students, professors, and chemistry professionals in the Seattle community.

After graduation, Chris plans to move to New York City. At some point, possibly in a year or two, he would like to attend graduate school and earn an advanced degree in either English or literature. He plans to maintain a science-based approach as he continues his studies. "When you take a chemistry mindset into other sorts of fields, weird things happen."

We wish him the best, and we are sure that as he forays into the world he will make it a "weirder" and more interesting place.

Alvin Kwiram Running for President of American Chemical Society

Professor Alvin Kwiram is one of two candidates who will stand this fall for election to the presidency of the American Chemical Society. The Department and the University are very pleased that one of our most innovative scientists and administrators has been chosen for this distinguished honor. If elected, Dr. Kwiram will serve three one-year terms as president elect, president, and past president.

Many of you may remember Dr. Kwiram as Chairman of the Department (1977-86). His leadership left a lasting impact in many areas. He revitalized the graduate student program, created the Biochemistry degree program, dramatically increased research funding, and hired nearly twenty new faculty members. The resultant demand for additional space was met first with renovation of Bagley Hall, and later by construction of the new building. Both projects are attributable to his tireless efforts.

This spring, Dr. Kwiram stepped down after 12 years as Vice Provost for Research. His tenure as head of that office was marked by an amazing series of successes. He helped to shape the University's intellectual property policy and technology transfer enterprise, and he developed or inspired the creation of numerous projects concerning technology use. Research funding at UW skyrocketed during his tenure (reaching a staggering $800 million in fiscal year 2002). He now has accepted the position of Executive Director of the new NSF Center for Materials and Devices for Information Technology. *(see story, page 12)*

The ACS reports that only about 20% of its membership chooses to vote in elections. In addition, margins of victory are often very small, maybe 1,000 votes, so every vote counts. We sincerely hope that the ACS members among our readership will choose not only to vote, but to cast those votes for Dr. Kwiram and spread the word among other ACS members. You may view Dr. Kwiram's position statement on the web at: http://depts.washington.edu/or/kwiram, or contact the Department to request a hard copy.

On August 8, 2002, the Department is hosting a symposium to honor Dr. Kwiram and to celebrate this new chapter in his life. To join us, call Shanon Radford at 206/543-1611 or visit http://staff.washington.edu/radfords/Kwiram/index.html

OUT WITH THE OLD LABS!

Remember taking physical chemistry lab? Most of our undergraduate alums do. Whether you took it in 1940 or sixty years later, the lab looked mostly the same, just a little older. A few years ago, we moved the undergraduate physical chemistry lab course to a newly renovated space, but the old p-chem lab has remained, until now, in disrepair.

Using funds sent from our state Governor intended to stimulate the lagging Washington economy, Chemistry has received $1.4 million to transform the p-chem lab into state-of-the-art wet chemistry spaces for 12 researchers. We hope to occupy the new labs by the summer of 2003.

We will provide renovation progress reports in future *ChemLetter* editions.

Conceptual Drawing of New Bagley Research Lab. Courtesy MBT Architecture.

Continued from Page 1

weakness and with a number one priority to increase salaries that have fallen very far behind our peers. In short, we still very much need your help. Your financial contributions pay an increasing fraction of our costs.

Please enjoy this edition of the *ChemLetter*. You will find it somewhat shorter than in the past. These abbreviated editions will come to you more frequently, allowing us to provide more timely delivery of the news. Look for the next edition early in 2003. Do consider using the enclosed reply envelope to tell us what you've been up to, so we may share this information with our readers in future volumes.

Sincerely,

Paul B Hopkins

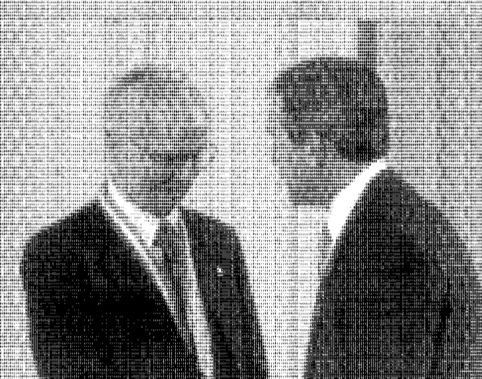
Paul B. Hopkins

National Medal of Science Recipient Returns to UW

Ernest R. Davidson, who spent more than two decades on the University of Washington chemistry faculty before leaving for Indiana University in Bloomington, returns to the UW this year as a Professor of Chemistry. Dr. Davidson joined the UW faculty as an associate chemistry professor in 1962 and was named professor in 1968. He joined the Indiana faculty in 1984 and became the IU Department of Chemistry Chairman in 1990.

The Terre Haute, Indiana, native received his bachelor's degree from the Rose Polytechnic Institute (now the Rose-Hulman Institute of Technology) in Terre Haute, and earned his doctorate from Indiana University. His research is focused, primarily, on computational quantum chemistry.

Dr. Davidson was awarded the President's National Medal of Science in 2002 "for his innovative leadership and numerous conceptual and algorithmic developments that led to the field of computational quantum chemistry and made possible the accurate modeling of chemical reactions and the response of molecules to radiation."



Dr. Davidson accepting his medal from President George W. Bush

Doctor of Philosophy

Summer 2000-Spring 2002

Kevin L. Bartlett, *A computational investigation of alkyl C-H reductive elimination reactions from platinum (II) and platinum (IV) and a computational and experimental investigation of tetrafluorocyclobutyne*, Weston Borden, Summer 2001.

Fredrik N. Bertil, *2D NMR studies of unusual DNA structures in solution,* Brian Reid, Spring 2001.

Maximiliane S. Boeckl, *Porphyrin self-assembly on gold for the design of molecular biorecognition surfaces*, Tomikazu Sasaki, Summer 2000.

Peter V. Bower, *Solid state nuclear magnetic resonance techniques for determining structure in proteins and peptides,* Gary Drobny, Winter 2001.

Jerome C. Bressi, *Structure-based design of glycolysis inhibitors as anti-parasite drugs,* Michael Gelb, Autumn 2000.

Wendy L. Connors, *Sequential injection analysis for the investigation of biomolecular interactions,* Jaromir Ruzicka, Autumn 2000.

Dawn M. Crumpton, *Mechanistic studies of Carbon-Carbon and Carbon-Hydrogen reductive elimination reactions from Platinum (IV) complexes,* Karen Goldberg, Autumn 2000.

Rogelio P. Diaz, *The amplitude of local angular motions of 13C-labeled thymines in DNA in solution,* J. Michael Schurr, Spring 2002.

Heather C. Edberg, *Regenerating the sampling interface of modular chemical sensing systems*, Lloyd Burgess, Winter 2002.

Anthony P. Esposito, *Resonance Raman studies of halooxide photochemistry in the gas and condensed phase,* Philip Reid, Winter 2001.

Catherine E. Foster, *Resonance Raman intensity analysis of Chlorine Dioxide in solution,* Philip Reid, Autumn 2000.

Carlos G. Fraga, *Comprehensive two-dimensional gas chromatography and chemometrics for the analysis of complex mixtures,* Robert Synovec, Summer 2000.

Byron D. Gates, *Self-assembly approaches to nanostructured materials*, Younan Xia, Autumn 2001.

Song Gao, *Laboratory studies in field measurements of organic compounds in tropospheric aerosols*, Dean Hegg, Spring 2002.

Scott A. Gerber, *Direct profiling of multiple enzymes in human cell lysates by affinity chromatography/electrospray ionization mass spectrometry: Application to clinical enzymology,* Frank Turecek, Winter 2001.

April Dawn Getty, *Syntheses and reactivity studies of hydroxo-palladium(II) and amido-platinum(IV) complexes, Karen Goldberg,* Autumn 2001.

Ann Wilson Grant, *Surface studies of model catalysts using metal atoms and particles on ZnO(0001)-Zn and –O and TiO2(110),* Charles Campbell, Spring 2001.

Sophia C. Hayes, *Chlorine dioxide photochemistry in solution: Time-resolved resonance raman and femtosecond pump-probe studies*, Philip Reid, Autumn 2001.

Andrew Graeme Henkelman, *Methods for calculating rates of transitions with application to catalysis and crystal growth,* Hannes Jonsson, Summer 2001.

Armando Herbelin, *Dispersion and gradients in flow injection,* Jaromir Ruzicka, Winter 2002.

Henry L. Jackson, *Synthetic models of Fe-type nitrile hydratase,* Julia Kovacs, Winter 2002.

Gisli H. Johannesson, *Optimal hyperplanar transition state theory*, Hannes Jonsson, Summer 2000.

Jenifer L. Johnson, *Development of redox microphysiometry to assay cell signaling and metabolism*, Craig Beeson, Autumn 2001.

Robert A. Kotchenruther, *Ozone photochemistry in the northeastern Pacific troposphere and the impacts of trans-Pacific pollution transport,* Daniel Jaffe, Autumn 2000.

James K. Law, *Investigation in transition metal dihydrogen and dihydride chemistry,* D. Michael Heinekey, Autumn 2001.

George M. McDonald, *Biosynthetic studies on phenazine antibiotics*, Heinz Floss, Spring 2001.

Benjamin J. McFarland, *Dissecting the cooperative energetics of the binding interactions between peptides and MHC class II proteins*, Craig Beeson, Summer 2001.

Gary A. J. Meints, *An investigation of local DNA dynamics in bacterial restriction sites by solid-state deuterium NMR*, Gary Drobny, Summer 2000.

Heather Mellow, *Synthesis and properties of two fold symmetric ruthenium and rhodium dihydrogen-hydride complexes,* D. Michael Heinekey, Autumn 2000.

Tamara Mae Okonogi, *Dynamics, thermodynamics, and structural investigations of nucleic acids using site-specific spin-labeling and electron paramagnetic resonance,* Bruce Robinson, Autumn 2000.

Nathan A. Oyler, *SSNMR methods for determining structure in nucleosides and peptides,* Gary Drobny, Summer 2000.

Wes W.C. Quigley, *The analysis of flowing liquids: Utilizing drop-based detection,* Robert Synovec, Spring 2002.

Alex L. Robinson, *Sonoluminescence for the quantitative analysis of alkali and alkaline earth chlorides,* Gary Christian, Winter 2001.

Adam J. D. Schafer, *The design and building of an alternating current scanning tunneling microscope for nanometer scale imaging of insulating surfaces,* Thomas Engel, Summer 2000.

Dirk Schweitzer, *Biomimetic models of the active site of the metalloenzyme nitrile hydratase*, Julia Kovacs, Spring 2001.

Jason M. Shearer, *Synthetic models for metalloenzymes containing sulfur-metal bonds*, Julia Kovacs, Autumn 2001.

David E. Starr, *Microcalorimetric heats of adsorption, surface residence times and sticking probabilities of metals on metal-oxide and silicon substrates,* Charles Campbell, Winter 2001.

Amy L. Szuchmacher, *Developing alternating current scanning tunneling microscopy and atomic fore microscopy to measure thin film properties on the nanoscale,* Thomas Engel, Summer 2000.

John Tomaszewski, *Structure and dynamics of small proteins by NMR,* Niels Andersen, Spring 2002.

Paul G. Vahe, *Broadening the applicability of water liquid chromatography through novel methodologies and micro-fabrication,* Robert Synovec, Autumn 2000.

Renee Van Ginhoven, *Self-trapped, excitons, defects, and water impurities in silica*, Hannes Jonsson, Spring 2002.

Burke S. Williams, *Studies of the reactivities of organometallic complexes containing platinum(IV)-oxygen bonds*, Karen Goldberg, Summer 2000.

A Note from the New Editor

You have probably noticed that the *ChemLetter* has a new look and feel. As Chairman Hopkins mentioned in his letter, it is also shorter and will be published twice a year (summer and winter). I plan to broaden both the topics covered and the range of authors whose work appears. Future editions will feature at least one article written by a faculty member or researcher detailing a current project, such as the one written by Dr. Daniel Gamelin (page 2).

I do not wish to render the *ChemLetter* completely unrecognizable. I plan to preserve established traditions, such as the Alumni Updates section. In order to do that, I need your help. Please call me, send an email, or complete the insert found between pages 6 and 7, and let me know who you are and what you are doing.

I also look forward to your input. I welcome comments, suggestions, or story ideas. If you are curious about a particular faculty member or project, please tell me. I hope you enjoy this and future editions of the *ChemLetter*.

Shana Radford

With Honors

Barry M. Goldwater Scholar: Cynthia E. Fisher

Phi Beta Kappa National Honor Society:

Jo H. Choi
Chun W. Choi
Bryan J. Chow
Eiko T. Clark
Cynthia E. Fisher
James J. Ham
Daven K. Henze
Michael R. Hirota
Lisa R. Jones
Siddhartha G. Kapnadak
Brent Y. Lee
D. Dorothy Li
Shin-E Lin
David E. Penner
Katrina R. Rotter
Christopher A. Samujh
Yasuko Tamura
Lorne W. Walker
Roger G. Wing
Jacqueline Y. Wong

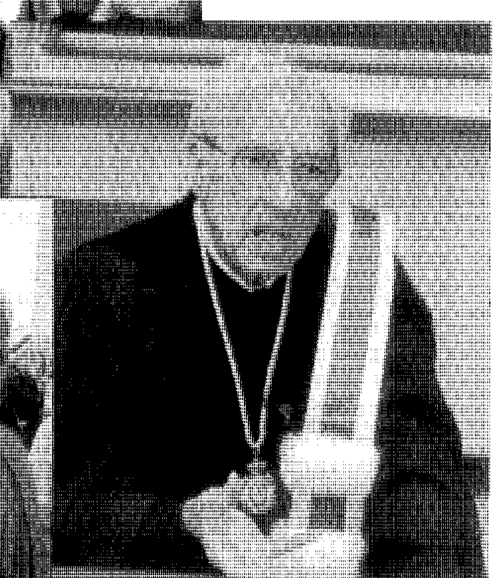
Baccalaureate Honors:

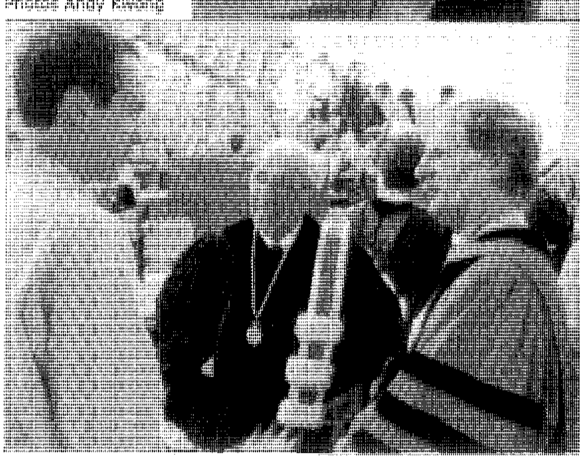
The top 10% of each UW college's or school's graduating class is awarded a series of distinctions based upon cumulative grade point averages.

Summa Cum Laude, 3.95
Brent Y. Lee

Magna Cum Laude, 3.86
Cynthia E. Fisher
Jennifer A. Fulcher
Michael R. Hirota
Lisa R. Jones
D. Dorothy Li
Nguyen-Khoi D. Nguyen
Lorne W. Walker

Cum Laude, 3.75
Jo H. Choi
Chun W. Choi
Eiko T. Clark
Alison D. Dragnich
Shin-E Lin
David E. Penner
Yasuko Tamura
Jacqueline Y. Yong





Clockwise from top: Professor Bill Reinhardt demonstrates principals of chaos theory; Edmond J. Fischer, Ph.D., delivers the keynote address; Professors Fischer and Reinhardt congratulate Chris Eide, B.S. Chemistry, B.A. Philosophy.

Photos Andy Kwong

Department Honors Graduates

The Department of Chemistry celebrated the accomplishments of this year's degree recipients at a special commencement ceremony held Friday, June 14, 2002.

Edmond H. Fischer, winner of the 1992 Nobel Prize in Medicine and Emeritus Professor of Biochemistry, delivered a thought-provoking keynote speech. He addressed a number of concerns facing modern science, from solving the problem of world hunger through genetic engineering of plants to the role the Internet will play in health management in the very near future. He reminded the graduates that success in the sciences requires both originality and the willingness and ability to collaborate.

This year's graduating class, one of the largest in our history, completed some of the most demanding courses offered by the University. So many awards, honors, and distinctions were earned that they cannot be listed individually here, though some very special achievements are highlighted in "With Honors" (this page). The Department is proud of each and every of our graduates.

Fellowships Strengthen Program

Mike Heinekey is a professor of inorganic chemistry and associate chairman for graduate studies. Chem Letter editor, Shanon Radford, recently spoke with Dr. Heinekey about the state of the Department of Chemistry's graduate student program.

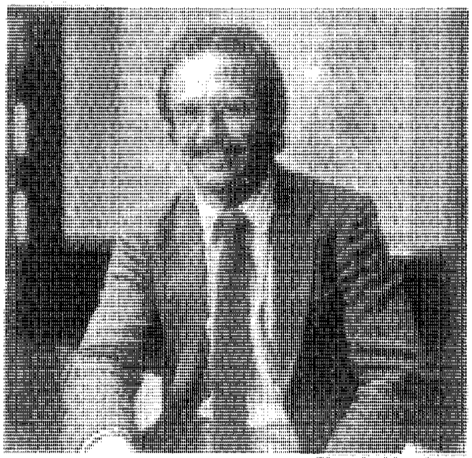


Photo by Mary Levin

What are the major challenges facing this department in running the graduate program?

The major challenge is recruiting, every year, a group of qualified and motivated students. There are many strong chemistry departments around the country. The number of bright young people attracted to Ph.D. programs in chemistry has declined in recent years due to increased competition from other fields such as biological and computer sciences. Well qualified students are typically admitted to several high quality programs. We need to convince a large fraction of them to join us at UW.

Are there any obstacles unique to the University of Washington?

Not really. Most programs face the same problem—a dwindling pool of applicants and a growing field of programs. Recruiting good graduate students is a very competitive business.

So what draws students to the University of Washington?

Well, we are very well-equipped, have an excellent faculty, and a reasonable scale of a program. The student-teacher ratio at UW is approximately 5:1, compared to about 8:1 at larger programs, such as Berkeley [where Dr. Heinekey was a post-doc]. Students here receive more individualized attention from their advisors. The "Seattle factor" works in our favor. We're in a very desirable location. We also offer competitive TA and RA salaries. Basically, we have a good program in a nice place.

What are some of the challenges facing the students?

The cost of living is high in Seattle, which is tough when you're a graduate student. Also, since most of the traditional chemical companies are located in the Midwest and on the east coast, many students have to relocate after graduation. Because of our location, UW receives less recruiting attention from the big companies, who are visiting fewer schools than in the past. And this is also where our smaller program size works against us. With companies making fewer trips, they tend to target the schools with bigger programs to have access to more students.

What are the employment prospects for those graduating from our program?

They all find jobs. It's just that those interested in working for a traditional chemical company will probably have to leave the area. However, those interested in biotech, pharmaceuticals, or even technology are well-positioned and probably have an advantage over their out-of-state peers.

What types of jobs are our graduates taking?

About 20-25% enter academics, and the rest move into private industry. And that's pretty comparable, I think, to other programs.

So how has graduate education changed over the past 50 years?

The actual nature of the experience probably hasn't changed that much, but the technology available to solve research problems has advanced a great deal, particularly computer technology. The educational program has evolved as the field has evolved. Chemistry, as a field, is far more interdisciplinary now than it was even 20 years ago.

What are the current hot research topics?

Biology, materials, nanotechnology. There's a great deal of work at the interface with biology. I think the first thing someone who graduated more than 20 years ago would notice is the elevated interest in materials science and biological problems.

If you could change one thing about our graduate student program, what would it be?

I would like to see more resources for graduate student fellowships. Fellowships are a real incentive and allow us the flexibility to reward good work, even when state money is tight. Our graduate program is very strong in many areas, and additional resources will ensure that we continue to attract top-notch students.

Grad Students Pick Up Where Rab Left Off

About two years ago, Emeritus Professor Seymour Rabinovitch and his wife, Flora, provided inspiration and generous funding that led to creation of a common area where graduate students, post-docs, faculty, and other researchers could gather to socialize and engage in scientific discourse. "Rab's Room" is now host to myriad Department events, including monthly socials held by the newly resurrected Chemistry Graduate Student Club.

This time last year, the Department's approximately 200 grad students had no formal mechanism for interaction outside of labs or group meetings. Unbeknown to each other, two students were exploring ways to connect with their colleagues outside the strictly academic sphere.

Mary Ann Leung, a second-year in Prof. William Reinhardt's theoretical chemistry group, wanted to address the issues facing under-represented groups. She began the process of establishing a club to focus on themes concerning women and minorities in Chemistry.

At the same time, second-year Shaun Dunnick missed the weekly socials he attended while an undergrad at UCSD. The two met at an informal meeting and decided to collaborate to reestablish the Chemistry Graduate Student Club.

They secured funding, registered with the University, held elections, and formed committees to address both general issues and special interests. The graduate student colloquium project, one of the few seminar series in this country run by graduate students, became a committee under the auspices of the club. Events, outreach, and public relations are all addressed through club committees.

The Catalysts Committee was formed and now sponsors seminars and special events, participates in mentoring programs, provides educational and training opportunities, hosts social activities and networking opportunities, and explores the past, present, and future of under-represented chemists in society.

Hans H. Brintzinger, 2001 Cady Lecture

"Olefin Polymerization with Zircocene Catalysts - Elementary Reactions and Reaction Paths" was the title of Professor Hans H. Brintzinger's Cady Lecture last fall. After an introductory retrospective on the development of stereoselective homogeneous polymerization catalysts, Dr. Brintzinger gave an account of the present state of knowledge with regard to the reaction steps by which active catalysts arise and participate in the polymerization process. His present research interests are centered on the synthesis of organometallic compounds, especially of chiral metallocenes, their reactivity with respect to diverse complex transformations and their use as homogenous catalysts for polymerization reactions, which are of interest also for practical applications. Professor Brinztinger has received several awards, including the Karl Heinz Beckurts Award, the Alwin Mittasch Medal, the Bailar Medal, the Walter Ahlström Prize of the Finnish Academies of Technology, and an American Chemical Society Award in Inorganic Chemistry. In 2000, he was awarded the Karl-Ziegler Prize by the Gesellschaft Deutscher Chemiker and an honorary doctoral degree by the University of Helsinki. He is a professor at the University of Konstanz in Germany.

JoAnne Stubbe, 2001 Hyp J. Dauben Lecture

The 23rd presenter of the Hyp J. Dauben lecture was M.I.T. Novartis Professor of Chemistry and Biology JoAnne Stubbe. Her laboratory uses chemical methods to understand biological processes. As such, the problems currently of interest to her group include the mechanism and structure of ribonucleotide reductases and their regulation in yeast, antitumor agents that cleave DNA, the enzymes involved in the repair of deoxyribose lesions, purine and polyester biosynthesis, and biodegradable polymers with properties of thermoplastics. Professor Stubbe has been a recipient of the Pfizer Award in Enzyme Chemistry (1986), ICI-Stuart Pharmaceutical Award (1989), M.I.T. Graduate Student Council Teaching Award (1990), Arthur C. Cope Scholar Award (1993), Richards Medal (1996), Cotten Medal (1997), and the Alfred Bader Award in Bioorganic and Bioinorganic Chemistry (1997). She was elected to the American Academy of Arts and Sciences in 1991 and to the National Academy of Sciences in 1992. Her Dauben lecture was entitled "Ribonucleotide Reductases in the Twenty-First Century." Professor Stubbe received her Ph.D. from the University of California at Berkeley and has been at M.I.T. since 1987.

Paul Alivisatos, Winter 2001 Colloquium

"Inorganic Nanorods: Synthesis, Properties, and Applications", discussed recent advances towards controlling the size and shape of anisotropically grown CdSe and Co nanorods using solutions of hot organic surfactants. Such nanostructures were shown to exhibit interesting and useful electrooptical properties. Dr. Alivisatos showed these nanorods to be useful in applications such as photovoltaic devices, light emitting diodes, and biological detection agents. Stirring much recent interest is the actual use of CdSe nanorods embedded in a polymer matrix in an efficient and functional photovoltaic cell. Dr. Alivisatos is currently Chancellor's Professor of Chemistry and Materials Science at the University of California at Berkeley. He has received numerous awards, including the Presidential Young Investigator Award, an Alfred P. Sloan Foundation fellowship, the ACS Exxon Solid State Chemistry Fellowship, the Coblentz Award, the Wilson Prize at Harvard, Department of Energy Awards for Outstanding Scientific Accomplishment in Materials Chemistry (1994) and for Sustained Outstanding Research in Materials Chemistry (1997), and the Materials Research Society Outstanding Young Investigator Award. He is a Fellow of both the American Physical Society and the American Association for the Advancement of Science. He is the Editor of the American Chemical Society journal, Nano Letters, and serves on the Editorial Advisory Boards of The Journal of Physical Chemistry, Chemical Physics, the Journal of Chemical Physics, and Advanced Materials. He is a senior member of the technical staff at the Lawrence Berkeley National laboratory, where he directs the new national nanofabrication facility, "The Molecular Foundry."

Upcoming Events

August 8, 2002
Symposium in honor of Alvin L. Kwiram
http://staff.washington.edu/radfords/Kwiram/index.html

October 25, 2002 - 3:30 p.m.
Symposium with special guest Gary Masada (Ph.D. 1972)
"Career Opportunities in Energy Technology"

November 6, 2002 - 5:30 p.m.
Industrial Poster Session

For more information, contact Shanon Radford at 206/543-1611 or on the web at http://staff.washington.edu/radfords

Watt Webb, Spring 2002 Colloquium

"Multiphoton Imaging of Life Processes" explored the exquisite subtlety of bio-molecular signals in a quest to understand dynamics of basic biophysical processes occurring at the molecular level. Professor Webb's group studies the dynamics of biophysical processes in living cells using modern physical optics. The group utilizes digital image-processing techniques to track individual molecular receptors on living human cells and fluorescence correlation spectroscopy to measure dynamics of molecular processes. The imaging of the dynamics of molecular processes in living cells is made possible by nonlinear laser scanning microscopy. Recent examples include observations of the secretion and storage of serotonin and related indoleamine neurotransmitters, mapping of the structural elastin and collagen fibers in skin, and measurements of metabolic state-all by multiphoton excitation of the autofluorescence of tissue components. Professor Webb is a Professor of Applied Physics at Cornell University. He has received numerous awards, including the APS Biological Physics Prize, the Ernst Abby Lecture Award, the Michelson-Morley Award, the Rank Prize for Opto-electronics, the Jablonski Award Lecturer, and the 2002 National Lecturer of the Biophysical Society.

Peter B. Schultz, 2002 Hyp Dauben Lecture

"New Opportunities at the Interface of Chemistry and Biology." Dr. Peter Schultz and his lab have been extraordinarily successful at harnessing and altering biological systems to develop novel technologies. One early example of this was his contribution to the development of immune system antibodies that could catalyze chemical reactions. More recently, Schultz and his group have been able to manufacture cellular systems that incorporate amino acids not found in nature. The resultant proteins can have novel characteristics that are not possible when confined to naturally occurring amino acids. Despite his success at manipulating the building materials of biological systems, Schultz is not content. He is currently working on going a step further and altering the blueprints of cellular construction itself: DNA. His hope is to incorporate a novel base pair into cellular DNA, opening a whole new field for exploration in the burgeoning cross-section of research between chemistry and biology. Professor Schultz is a Professor of Chemistry at The Scripps Research Institute, a member of the National Academy of Sciences, founder and director of several biotech companies, and the recipient of many awards and honors, including the Wolf Prize in Chemistry and the Arthur C. Cope Young Scholar Award.

NSF Funds Photonics Research Center

By Vince Stricherz
University News & Information

The National Science Foundation has chosen the University of Washington as the host of one of six new science and technology centers, a designation that would place the university firmly at the leading edge of research to develop groundbreaking information technology.

The Center for Materials and Devices for Information Technology Research likely will receive $19 million in NSF funding in the next five years and could receive more than twice that amount over 10 years. NSF officials will work out specific details of the awards during the next several months.

Professor Larry Dalton

"The technology developed in this center should have a significant economic impact on the Seattle area and the nation."

With the NSF award, along with recent grants from other federal agencies and a substantial investment from private industry, the total investment in UW photonics research could exceed $100 million in the next decade, said Larry Dalton, director and lead scientist for the new center.

Dalton, a leader in the field of photonics, is best known for developing polymers that serve as electro-optic modulators and switches, or "opto-chips." They are microscopic devices that can translate electronic signals such as television, computer, telephone and radar into light signals at rates up to 10 times faster than the current fastest speeds. Once translated from electrical to optical format, the information can be transmitted at light speed using fiber optic systems.

Dalton's advances in photonics already have led to the creation of a Bothell-based company called Lumera Corp., a subsidiary of Microvision Inc., and have brought new UW faculty working in the area of photonics. Research by the academic participants in the new NSF center has stimulated the creation of a dozen companies in the last several years.

"The technology under research in this center is revolutionary, and it is already affecting thinking at corporations around the world, such as Lockheed Martin, Boeing, Corning, and Lucent," Dalton said. A center similar to the new NSF center has been established in Europe, and it is exploring a partnership with the UW-based center, he said.

UW Provost Lee L. Huntsman said the NSF award ensures the university's photonics research will continue to grow.

"The possibilities and applications of this cutting-edge research are endless," Huntsman said. "It has the potential to change the ways we communicate as much as the technology revolution that has taken place in the last two decades. The university is an international leader pioneering this field, and we can expect the state and region to become industry leaders in this arena as well."

The NSF award is the latest in a recent series of grants to the UW for photonics research. They include:

** A $5 million Multidisciplinary University Research Initiative award from the Defense Department for a "smart" materials center.

** A $5 million defense award from the Nanoscience and Nanotechnology Initiative for development and application of "biomimetic" materials (those that mimic biological function).

** A $2 million NSF grant for creation of a Nanotechnology Integrated Research Team.

** A multi-million dollar award to The Boeing Co., the California Institute of Technology, and the UW from the Defense Advanced Research Projects Agency.

** A multi-million dollar award from the Ballistic Missile Defense Organization for development of electro-optic materials.

The UW also is participating in a $5 million defense nanotechnology award for which the State University of New York is the lead institution, and a $6.7 million defense award for nanoscale materials for which the University of Southern California is the lead institution.

"If we're right, this is where the future lies," Dalton said. "The technology developed in this center should have a significant economic impact on the Seattle area and the nation. It will have impacts on telecommunications, defense, computing, transportation, and personal and home electronics."

Because of the broad impact, business, academic, and community leaders from across the country have agreed to serve on the center's advisory board.

Already the spate of significant awards is having a strong impact on graduate student recruitment, and even appears to be drawing more undergraduates, Dalton said. The NSF award includes money to allow students from historically black colleges and universities, women's colleges and underrepresented groups to study in the UW program and at affiliated universities. It also provides money for educational outreach to elementary and high school students.

The NSF decision to finance the UW's photonics research represents a significant change in technological focus, choosing an alternative approach to ultrafast information processing and communications rather than pursuing traditional semiconductor research.

"We won the center because nationally recognized experts sat down, compared proposals, and selected ours over excellent and high-powered competition," Dalton said. "This is a gratifying endorsement."

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