UNIVERSITY OF OREGON

Chemistry News

COLLEGE OF ARTS AND SCIENCES · DEPARTMENT OF CHEMISTRY · 2009

INSIDE

Lorry I. Lokey Laboratories: Integrative Science, Innovative Research

Walking into the Lorry I. Lokey Laboratories from the entrance between Deschutes and Huestis halls on the University of Oregon campus is not much different than walking downstairs into any building, but this building is completely underground. The facility is a signature research center associated with ONAMI, the Oregon Nanoscience and Microtechnologies Institute, a collaborative venture involving the UO, OSU, Portland State University, Pacific Northwest National Laboratory, and regional industry representatives, designed to cultivate research leadership and high-tech economic development in Oregon.

A $10 million gift from Business Wire founder Lorry I. Lokey in 2006 initiated construction of the 26,000-square-foot building, phase one of the two-phase, $76 million integrated science complex. Within the Lokey Lab is CAMCOR, the Center for Advanced Materials Characterization in Oregon. More than twenty high-tech instruments fill CAMCOR's MicroAnalytical Facility, Alice C. Tyler Nanofabrication and Imaging Facility, Nuclear Magnetic Resonance Spectroscopy Facility, Surface Analytical Laboratory, X-Ray Diffraction Lab, Device Fabrication and Characterization Lab, and the Photovoltaics Characterization Facility.

John Donovan using a Cameca SX50 Electron Microprobe Analyzer in the MicroAnalytical Facility in the Lokey Laboratories.

Integrative Science

The facility's impressive array of equipment and trained technicians and scientists are available for interdisciplinary research projects, bringing together scientists in the fields of chemistry, biology, physics, anthropology, geography, and geological sciences. "There are no departments here," says John Donovan, director of the CAMCOR MicroAnalytical Facility, "this facility belongs to everyone. For a single faculty member or even a single department to get a Titan (a state-of-the-art transmission electron microscope, in which a beam of electrons interacts with an ultra-thin sample, with down to a 0.8 Angstrom resolution) is almost impossible. They're $5 million each. By combining resources and support . . . it's more bang for their buck because instead of supporting ten graduate students, we can support fifty grad students or 100 grad students with this investment, and in times of tight budgets that's a very important consideration."

Economic Impact

The nation's budget tightening does not seem to have affected ONAMI very much. When the funding for

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UO Women in Graduate Science: Helping University Women Become Successful Scientists

When UO alumna Sara Staggs first formed the UO Women in Graduate Science organization (UOWGS) in 2004, there was no funding, so Staggs sought out speakers who were already on campus for other events, and asked them to speak to her fledgling membership. Today, the group has a fully formed program aimed at strengthening ties between female graduate students and women in industry and academia throughout the sciences.

The group is a student-run organization with graduate students from many disciplines. Though membership began in the chemistry department and was predominantly chemists for the first few years, they have expanded outside of chemistry into physics, biology, neurology, and geology.

President Brandy Fox has been involved as an officer of UOWGS for four years. The organization strives to reach out to incoming graduate students to let them know the group is there for them, and works to meet the needs of the forty or so members. "Women are definitely in the minority in chemistry, not necessarily at the bachelor's level but once you get up into the graduate level," Fox says. The group was founded in order to offer "a support group and find out from different female speakers about their life path, how they got where they are and some of the challenges they faced."

Fox, who is in the chemistry Ph.D. program and is working in David Tyler's lab, entered her career at Oregon as a first-year Ph.D. student, and began to seek out other women. "Of the nine students entering in the organic-inorganic division, I was the only female," she says. "That's not a typical situation, we're really not only 10 percent female, but for me, that's kind of how I felt." Membership is both male and female. "It's an organization for anybody who supports women in science," Fox says.

Networking is one of the main goals of the group. UOWGS hosts monthly speakers, along with two skill-building workshops each year. "We try to be very interactive," Fox says. Past workshops have included public speaking and mock interviews with group members conducted by people from local businesses. Events for the 2009–10 school year include an intellectual property and patent law workshop. "We try to provide skills and information that students don't necessarily pick up in the course of graduate school but which are nonetheless very important skills," Fox says. Life Technologies (formerly Molecular Probes, then Invitrogen) is a major collaborator with the group, cosponsoring workshops and providing an opportunity for members to develop networks with, and benefit from, the experience of biotech professionals.

Outreach is a primary goal of the group. UOWGS members frequently visit local schools and talk about career paths in science and give a few demonstrations. "All of our outreach events are targeting younger girls to help get them interested in careers in science," Fox says. "There's something really rewarding about reaching out to the high school kids and encouraging them—you know, 'You can do it'—and be a positive role model."

In addition, last years' speakers included Judith Iriarte-Gross, who runs a successful women-in-sciences group at Middle Tennessee State University. "It was definitely useful," says Fox. "It gave us all ideas as we move forward, of how we can reach back and bring girls up behind us."

UOWGS President Brandy Fox

Last year, for the first of what is planned to be an annual event, UOWGS held a Generations Luncheon, in which high school students, undergraduate students, graduate students, and professionals in both industry and academia are brought together at a luncheon to share knowledge and mentoring. "I think its really valuable, especially for the high school students who don't necessarily get to see a lot of role models in that position," Fox says, "and undergraduate students who may not know what they want to do get a chance to talk with professionals in industry and academia."

The organization supports its members through awards. Two travel awards are offered annually to help a member travel to a conference and give a presentation or poster in their field. One single-parent award is awarded yearly, which is designed to assist with the extra expenses a single

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the Lorry I. Lokey Integrative Science Complex was announced, a major goal was economic support for high-tech industry in Oregon. ONAMI's executive director, Skip Rung, noted in the August 2009 ONAMI newsletter that in the fiscal year 2009 research members collectively won a record $36.6 million in new awards from federal and private sources. He notes, "This is after subtracting $4.5 million in internal subcontracts and before any effects of federal stimulus spending." Net research award volume won by ONAMI member researchers is more than $50 million, well above the biennium goal of $40 million, and major private gifts to ONAMI facilities are above the $32 million mark. Gap fund companies (funded through the State of Oregon for the purpose of technology-based economic development, to close the funding "gap" between research and product) have collectively raised more than $13 million in outside funding to date (leveraging $2 million in ONAMI grants).

Building Features

Set upon miles of bedrock that minimizes vibration interference, with shielding for electromagnetic interference, and with 0.1 degree Fahrenheit temperature control, the building is perfectly suited for nanoscale research. "This is probably one of the best-performing buildings in the entire world in terms of siting for nanotechnology and characterization," Donovan says. "One consultant told us this was the second-quietest site he had ever measured, the quietest being a remote mountaintop in New Mexico."

The first thing that catches the eye upon entering is a cool blue glow emanating from the ceiling. At first glance, the facility does not look like much more than a rectangular shaped complex of offices. A large common area in the center serves as a place for students to eat, talk, and study. It's only once you start opening doors and peering into quiet labs that the true purpose and potential of this place reveals itself. Within these walls, the research taking place is poised to place Oregon squarely at the forefront of safe, environmentally benign, and socially conscious nanotechnology.

CAMCOR's slogan is "Oregon's High-Tech Extension Service." "People can relate to it because they understand about agricultural extension services," says Donovan. "If a farmer has a problem he can go to a scientist at OSU and get help, which is a good bottom line for the state but there's nothing like that for high-tech industries." While some of the larger companies have a lot of the equipment they need, they don't have everything. Intel and Hewlett-Packard make use of the instrumentation at CAMCOR, as do more than sixty small- to medium-sized high-tech companies currently. Researchers located anywhere in the world can rent time on the instruments twenty-four hours a day, seven days a week. Webcams on each instrument are linked to the NanoNet, a next-generation computer network allowing researchers to watch as their samples are examined.

One of those companies is Bend Research, a pharmaceutical division of Pfizer, which is developing vaccine delivery technologies that use no needles. This work should remove barriers for getting people vaccinated, such as fear of needles, and alleviate issues of needle reuse in poorer countries that can lead to disease transmission. "You know the Star Trek hypo-spray?" Donovan queries. "They've got such things now but they're only subdural—they don't actually go into the bloodstream, where you sometimes need a vaccine to go." Researchers are using gold nanoparticles that are coated with the DNA of the virus in order to stimulate an immune reaction. The nanoparticles penetrate into the blood and create an innoculation without needles. Bend Research is using CAMCOR equipment to examine the coatings on their nanoparticles.

Another Oregon company, Perpetua Power Systems, is developing a thermoelectric power source that essentially generates electricity from heat. "They can actually stick the power source onto the side of a motor that's hot, and that will generate enough power for monitors and other sensor needs," Donovan says. "We're characterizing the thermoelectric thin films that can create electricity from heat."

"These companies love that they can come down here on an hourly basis and get an answer to a problem they have for a few 100 dollars an hour," Donovan says. "They avoid the expenditure of millions of dollars not just on the instruments, but the maintenance and the staffing, which over time costs more than the instrument." Donovan worked for three years on a project with Johnson and Johnson developing new, long-wearing contact lenses that were inherently antibacterial based on nanotechnology. "They are actually going into manufacturing right now," Donovan says. "We did the nanocharacterization and they spent, I think, close to $300,000 in development with us."

Interdisciplinary Research

The frontiers of science, though they are constantly expanding, are also increasingly being brought together. Rarely now is such research being conducted in isolation, and especially at Oregon. The shared instrumentation at facilities like CAMCOR results in a merging of fields and information. Donovan uses archeology as an example. "The typical tools of the trade are a shovel, and maybe a brush and a dental pick or something," he says. He refers to new research advanced by James Kennett of UC Santa Barbara. Kennett and his colleagues studied a carbon-rich layer of soil extending across North America that dates to 12,900 years ago, a date contemporaneous with the end of the Clovis people and mass extinction of large mammals in North America: wooly mammoth, saber-toothed tiger, dire wolf, giant ground sloth, American horse, American camel. "Apparently something interesting happened here," Donovan says. A lack of evidence or plausibility taints the various theories that have been floated, but then the researchers started looking at this layer in more detail. "They

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Department Head's Perspective

As I type this intro, my first as the department head of chemistry, it is a beautiful sunny yet chilly Eugene morning. Fall is definitely in the air, which

Mike Haley

is represented by all of the gold and red leaves on the campus trees. Not to worry, though—by the time you read this, the rainy season will have returned with a vengeance, as it always does. We have a number of exciting things afoot in the department, many of which are highlighted in this newsletter. First though, I offer my heartfelt thanks and appreciation to my predecessor, Tom Dyke. Tom retired last summer after more than thirty years of teaching, research, and service to the department and the UO, including the last five years as department head. In 2003 Tom inherited a department in financial turmoil. Thanks to his skills and efforts, we weathered the financial storm and I took over at the helm with our books in the black for the first time this decade. Deservedly so, the university conferred emeritus professor status to Tom last fall. Congratulations, Tom—enjoy your retirement!

Looking back at what previous heads have written, "change" always seems to be the topic. Instead of focusing on the changes of the two years since the last chemistry newsletter, I thought it would be interesting to highlight some of the tremendous strides forward we have made over the last ten to twelve years. Thanks to the generosity of donors, we now have five named chairs and professorships in chemistry, compared to none in 1997. These positions, such as the Lokey-Harrington Chair in Chemistry highlighted in this newsletter, are essential if we are to retain top-notch faculty members. Our efforts in graduate student recruiting are paying great dividends, as this fall we had our largest incoming class of new graduate students (twenty-eight) in my more than sixteen years at Oregon. This is in contrast to the late 1990s when new grad students numbered in the mid-teens. I recall teaching Advanced Organic to three students during the winter 1997 term; this fall there are twenty-five in the course. Research assistantships from block grants from the NSF and the NIH now number over forty, compared to about ten in 1998. In 1997, we had one aging NMR spectrometer for general use; we now have five instruments and just received grant money for a sixth. Probably the most telling statistic is the fact that total ongoing research funding within the department has more than tripled since 1998. Now, those are some changes!

Though I just painted a positive picture, it is not perfect. There is still desire and room for more change. While most of the undergraduate laboratories have been renovated since 2000, the General Chemistry Laboratory in the basement of Klamath Hall has been essentially untouched since it opened in 1967. With forty-plus years of wear and tear, the lab is showing its age and needs to be replaced. Another area for improvement is graduate student support. Surprisingly, the Rosaria P. Haugland Graduate Research Fellowship is the only named or funded fellowship within the department. Given the fact that chemistry only receives twenty teaching assistantships from the university (comparator schools generally have more than fifty such positions), we need to redouble our efforts to establish such fellowships. Admittedly, both of these goals will be quite challenging as we all labor through the "Great Recession," especially now that state funding for the university's total budget has fallen below 10 percent. Fortunately, the belt-tightening the chemistry department went through under Tom Dyke's leadership has meant (so far) that our cuts have been mild compared to those in neighboring states. Let's hope it stays that way.

Enough already! Enjoy the newsletter, and if you find yourself in the Eugene area, please stop by the campus for a visit. We would love to give you a tour and a chance to see all the changes for yourself. I know you would be impressed!

With best regards,
Mike Haley

UO Women in Graduate Science: Helping University Women Become Successful Scientists

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parent incurs in graduate school, along with one undergraduate transition award that is designed to help offset the costs of transition for a promising undergraduate at the University of Oregon who is heading off to graduate school.

Fox hopes that women in graduate science, regardless of their discipline, will seek out the UOWGS. "It is nice to have a support group," she says. "We put on a lot of good events. I feel like the workshops tend to be very worthwhile. You do get a lot of good skills. We don't require people to be members to participate in our events—they're open to anyone who wants to come. Anyone in any discipline who would be interested in whatever we're doing." *—Vanessa Salvia*

Find out more about UOWGS at its website: uoregon.edu/~uowgs.

New Faculty Members

Victoria J. DeRose

Victoria DeRose joined the chemistry department faculty as a professor in 2006. Her areas of focus are bioinorganic chemistry, biophysical chemistry, and chemical biology. She

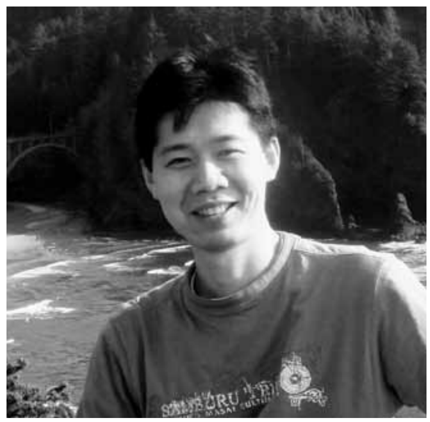
Victoria DeRose

received her B.A. from the University of Chicago in 1983, her Ph.D. from the University of California at Berkeley in 1990 (Mel Klein and Ken Sauer), and held a postdoctoral position at Northwestern University (Brian Hoffman). Before coming to Oregon, she served as an assistant professor (1995–2001) and associate professor (2001–5) of chemistry at Texas A&M University. Her honors and awards include the following: NIH Postdoctoral Fellowship, 1991–94; NSF Faculty Early Career Development Award, 1997; Research Corporation Cottrell Scholar Award, 1998; Center for Teaching Excellence Montague Teaching-Scholar Award, 1999; AFS College of Science Teaching Award, 2000; University of Oregon Fund for Faculty Excellence Award, 2008.

Victoria DeRose's research interests in her own words: "We are investigating chemical activity and structure in nucleic acids and proteins, with an emphasis on metal interactions. Proteins have long been known to exploit and tune the reactive properties of metals in order to perform reactions that are sometimes unavailable to the bench-top chemist. It has only recently been determined that ribonucleic acid (RNA) also catalyzes chemical reactions in certain biologically important systems. RNA has its own distinctive metallobiochemistry. Our research group examines such systems using tools of biological and bioinorganic chemistry, and spectroscopic methods. These are interdisciplinary studies that lie at the interface of biology and chemistry." *—James Cervantes*

Shih-Yuan Liu

Shih-Yuan Liu joined the chemistry department faculty in 2006, as an assistant professor with a focus on organic, organometallic, and inorganic chemistry. He received his B.S. degree in chemistry from Vienna University of Technology, Austria, in 1998. During his undergraduate education, he spent



Shih-Yuan Liu

a year abroad at UNC Chapel Hill as part of the Transatlantic Science Student Exchange Program, where he worked under the guidance of Professor James P. Morken. He did his doctoral work at MIT with Professor Gregory C. Fu and received his Ph.D. degree in organic chemistry in 2003. He then pursued his postdoctoral studies in inorganic chemistry with Professor Daniel G. Nocera, also at MIT. Shih-Yuan Liu's research interests include the chemistry of boron-nitrogen heterocycles and the development of novel synthetic methods. His major research theme is to exploit the unique properties of 1,2-dihydro-1,2-azaborines (BN heterocycles that are very similar to benzene) and investigate their potential as unnatural arene surrogates in materials chemistry and biomedical research. One particular focus is the development of these BN-containing heterocycles as efficient hydrogen storage materials. *—James Cervantes*

Brad Nolen

Brad Nolen joined the chemistry department faculty in fall 2008 as an assistant professor with a focus on biochemistry, molecular biology, and biophysics. He is also a member of the Institute of Molecular Biology. Nolen received his B.A. from Missouri State University in 1997, his M.S. from the University of California at San Diego in 1999, and his Ph.D. from UC San Diego in 2003 (Gourisankar Ghosh). He did postdoctoral work at Yale University from 2003 to 2008 (Thomas D. Pollard). Among his honors and awards are the following: Ruth L. Kirschstein National Research Service Award, 2004; American Association for the Advancement of Science membership; Mass Media Fellowship, 2002; and the American Heart Association Postdoctoral Fellowship, 2001.

Brad Nolen's research interests in his own words: "The Nolen lab is investigating the molecular basis for regulation of the cytoskeleton, the molecular framework that provides physical support for cells. One of our primary interests is actin, a highly

Brad Nolen

conserved eukaryotic protein that polymerizes into two-stranded helical filaments. Rearrangements of the actin filament network are critical for cellular processes that require a change in cell shape, such as motility, uptake and release of materials, and cell division. To regulate these processes, cells utilize a myriad of proteins to control polymerization, depolymerization, severing, capping, and cross-linking of actin filaments. *—James Cervantes*

Jim Hutchison Awarded Endowed Chair

Professor of Chemistry James "Jim" Hutchison was appointed as the first Lokey-Harrington Chair in Chemistry. The endowed chair was made possible as part of a 2007 gift of $74.5 million from Lorry I. Lokey, namesake of the University of Oregon's new science complex. Hutchison received the award in September 2008.

Jim Hutchison

"It is an honor to us and a validation of the field of green chemistry to have our work recognized through this chair," Hutchison says. "I really appreciate Lorry and Joanne's support of our work." The chair, which is named for Lokey and his companion, Joanne Harrington, recognizes Hutchison's research into green chemistry and nanotechnology. Hutchison began his career at the UO in 1994, and quickly became a leader in the field of green chemistry; his curriculum for green laboratory courses has become the model in many universities and community colleges throughout the country.

"Professor Hutchison's peers at other universities and national science institutes remarked, again and again, that he is a recognized leader in the world of materials science," says Mike Haley, head of the UO Department of Chemistry. "We are honored to recognize his accomplishments with this endowed chair and provide him the opportunity to continue researching the technologies of the future."

Hutchison is also a leader in the field of nanoscience. He is the founding director of the Safer Nanomaterials and Nanomanufacturing Initiative (SNNI) and helped found the Oregon Nanoscience and Microtechnologies Institute. The SNNI focuses on proactive approaches to making nanotechnology safe and green by design. He is also the associate vice president for research and strategic initiatives, and a member of the faculty of the University of Oregon's Materials Science Institute. —*Vanessa Salvia*

Faculty Retirements

Thank you, Bruce Branchaud and Tom Dyke, for your service to the Department of Chemistry and the University of Oregon!

Bruce Branchaud

Bioorganic faculty member Bruce Branchaud retired at the end of 2007, part-way through his twenty-fifth year at the University of Oregon. He is professor emeritus and is also pursuing a career in the biotech industry with Life Technologies, a global biotech tools company with nearly 10,000 employees and more than $3 billion in annual sales. In fall 2005, Bruce took a two-year leave of absence to work full-time with Invitrogen as director of global chemistry.

By early 2007, five of the Ph.D. students in the Branchaud group had completed their degrees and one other Ph.D. student had joined the Liu group. In April 2007 the Branchaud labs were fully shut down when all of the equipment in the labs was given to other groups in the department. When Invitrogen and Applied Biosystems merged in late 2008 to form Life Technologies, Bruce was given a new corporate-level position, as leader for emerging technologies in chemistry for the company.

Throughout his career Bruce has published eighty-eight frequently cited papers and applied for two patents. Bruce now has a small office in the department and still tries to participate regularly in some aspects of departmental life, especially the seminar programs. Bruce looks forward to a lifetime of meaningful membership in the University of Oregon academic community. *—Bruce Branchaud*

Tom Dyke

After thirty-four years of teaching, research, and administrative work at the UO, I "retired" in June of 2008. My research area was mostly concerned with high-resolution spectroscopy of molecular dimers and clusters held together by hydrogen bonds and van der Waals interactions. We use molecular-beam techniques to make these molecules and various types of rotational and vibrational spectroscopy to find rotationally resolved spectra and structural information. Our work on water dimer (H2O)2 structure is probably the best known of this work, and we looked at many other interesting species such as ammonia bound to water, NH3-H2O, and various van der Waals–bonded clusters. In addition to research and teaching, I found to my surprise (and the greater surprise of my friends and colleagues) that I could do a variety of administrative tasks and even enjoy them. So, over the years I served as institute director in the old Chemical Physics Institute, chemistry department head, associate dean for science in the College of Arts and Sciences, and vice provost for research. While often stressful, these administrative jobs gave me an interesting look at the various cultures around the university—they are diverse!—and some insight into how a complex organization like the UO works.

I owe a very large debt of gratitude to my colleagues who have put up with me over the years, and particularly the graduate students who did the research I was talking about above. Thanks to all of you for contributing to my education!

Since retiring, I have mostly been . . . working. I am teaching a variety of courses, including General Chemistry, which I am enjoying immensely. I am starting to write a book for Oxford University Press entitled *Molecular Beam Spectroscopy*. I am sure it will be a bestseller, so get your advance orders in now. Before starting this project, I had a little more time for gardening, hiking, and my grandchildren, but right now it feels more like the old routine! *—Tom Dyke*

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found that it is full of nanodiamonds," Donovan says, "and these are things that no archeologist would ever be able to notice in the field or even with their microscopes." The nanodiamonds are about 5-100 nanometers in size (a nanometer is a billionth of a meter). Though these nanodiamonds have long been known in the laboratory, the only known way that these can be produced naturally is through an explosion of nuclear weapons or an extraterrestrial impact. Kennett's new theory is that a comet hit the Great Lakes region when it was covered by 3 kilometers of ice, resulting in no crater but a climate change significant enough to wipe out everything in North America. So far, Donovan says, this research is controversial but is being actively investigated. "It's a neat example of getting scientists access to tools that they would never normally have access to," Donovan says. "No archeologist would generally have access to these tools." An episode of the television show Nova called "Last Extinction" discusses this recent research.

The CAMCOR MicroAnalytical Facility is currently running tests on some of these nanodiamonds. The scanning electron microscope reveals diamond "blobs" or sphereules, showing carbon-rich areas. When the samples are transferred to the transmission electron microscope, the instrument returns crystallographic information. Most of these impact nanodiamonds are hexagonal diamonds—rather than the cubic variety, which form through high-temperature, high-pressure earth processes—a few hundred nanometers across, rather plate-like in appearance. "We're trying to find a way of characterizing these carbon sphereules that show up in this layer," Donovan says. "They think they formed from the vapor deposition of ultrahot gas from the impact." Carbon sphereules are commonly found in very hot fires, but nanodiamonds are not associated with these terrestrial processes. "These are definitely unique. We're trying to find a way to identify them easily . . . by looking at the light emission." Donovan is working with a materials scientist at Santa Barbara who is interested in the nanodiamonds. Several new forms (allotropes) of diamonds have been discovered in these impact materials and some of them are reproducible in the lab. "They're actually diamonds that have a different atomic structure; they have properties not exactly like cubic diamonds but diamond-like. They are very interesting from a materials perspective because we might want to use some of them technologically," Donovan says. "Diamond is going to be the next material that you're going to see everywhere on industrial projects."

Lorry Lokey at the grand opening of the Lorry I. Lokey Laboratories.

Strong Outreach

The facility hosts many opportunities for students to experience the innovative research and become familiar with the equipment; many of them are through the Materials Science Institute (materialscience.uoregon.edu). The NSF-funded UCORE program (Undergraduate Catalytic Outreach and Research Experiences) brings students from selected community colleges to the facility for a ten-week, paid summer internship in chemistry, physics, or geology. Rock Camp is an intensive one-week, all-expenses-paid program for undergraduate chemistry and physics majors. High school students are invited to work in the lab through Saturday Academy, open to students in their junior and senior summers for an eight-week program that matches them with faculty members to do various research projects. Also, a handful of academic courses and seminars are available, which provide detailed introductions to theories of instrumentation.

Last fall marked the first time that the facility collaborated with chemistry students at Bend High School in Bend, Oregon. Paul Hutter, Bend High's chemistry teacher, worked with John Donovan to do a "video conference" for the school's two chemistry classes. Donovan performed a lab and walked the classes through the experiment using a video camera and an Internet connection.

Hutter says the students responded very well. "It opened their eyes to what the UO offers and gets them thinking about the type of facilities they want in a college. They got to thinking, 'It's not just about the parties, it's about what does college really have to offer to me,'" Hutter says. Donovan used a microscope to analyze a commercially available dish to determine if it had a lead content. "The kids could really relate to that because there was some recent stuff in the news about lead being in things made in China, so it was like, 'Oh, I get it. I think I understand now why someone would want to use this equipment.'"

Hutter reports that last year the school had "maybe between eighty and ninety students a year," or three classes' worth, enrolled in chemistry. Now about 210 kids are taking chemistry. "I think one of the reasons is the ways that we are reaching out and the labs that we're doing," Hutter says. "This lab was a service that was provided free of charge to us, which was nice because with the limited resources that we do have, this is something that is possible for a high school to be able to do."

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Green Chemistry News

Meyer Family Foundation Grants: Deborah Exton, Julie Haack, David Tyler

Three faculty members of the University of Oregon chemistry department have been awarded grants through the Meyer Memorial Trust and Meyer Fund for a Sustainable Environment. Senior Instructor **Deborah Exton** was awarded a grant to develop a green general chemistry laboratory curriculum in collaboration with John Thompson, a chemistry instructor at Lane Community College. The project began by evaluating the existing laboratory curricula and identifying which experiments were currently green, which could be "greened up," and which were unfixable. In addition, new labs for development were identified. Opportunities to enhance the educational messages within the existing labs were seized upon by the team. "A lot of what I've been doing is taking our existing experiments that are already green and writing features within them to discuss green chemistry in the context of that experiment. In some instances the focus has been on why the experiment is green and in others we have concentrated on relevant applications of what we're studying in that experiment," Exton explains. "We are interested in showing the students how the green concepts can be used in a real-life setting."

The Meyer Fund is an Oregon-based family foundation that is committed to sustainability and funding projects that have a broad impact. The UO-LCC collaboration began in summer 2008 and was funded for one year. The greatest benefit to receiving the grant, says Exton, was simply being allowed the time and money to realize their ideas. "All of us working on the labs have had lots of ideas but haven't had time to implement them," she says. "The grant money freed us to work on laboratory development so that we were able to then write these modifications and additions to the labs and develop new experiments."

Assistant department head **Julie Haack**, in collaboration with Andrew Nelson and Jennifer Howard-Grenville of the UO's Lundquist College of Business, received a $34,566 grant through the Meyer Fund for a Sustainable Environment to study how university-based sustainability research and education influences industry and policy.

Universities are at the forefront of developing science-based solutions to address the grand challenges in sustainability. Unfortunately, we have little understanding of how this research moves beyond individual labs and universities into broad communities of research and practice. Without an enhanced understanding of these processes and channels of diffusion, promising sustainability solutions may fail to yield real-world results.

The proposed project, "Spreading Sustainability: How Science-Based Solutions Move to Broad Practice," uses the emergence, development, and successful diffusion of green chemistry as a case study to identify generalizable mechanisms by which innovative science-based approaches spread within and beyond academia and gain legitimacy among diverse audiences. Graduate students Doug Young (chemistry) and Andrew Earle (business) are working together to build a literature data set that will form the foundation for studying how green chemistry knowledge was developed and diffused throughout the research community. "I really enjoy working with my colleagues in the business school," Haack says. "This collaboration is changing how I think about knowledge diffusion and will hopefully translate into a better understanding the impact of knowledge creation, AKA basic research, on society."

On September 15, 2009, chemistry professor **David Tyler** wrapped up an intensive five-day workshop on sustainability that was funded by the Meyer Family Foundation. The purpose of the workshop, in its second year, was fourfold: to try out new curriculum and teaching styles in anticipation of upcoming curriculum revisions, to teach students to communicate science to the public, to immerse students in a topic to mentally prepare them for the intensity of graduate school, and to expose students to the education and research programs of the Materials Science Institute (MSI).

The workshop was open to all entering graduate students, and took an interdisciplinary look at issues of sustainability. "The MSI is all about knocking down the barriers between departments," Tyler says. "We had people from the UO business school talking about sustainable business practices, a representative from the Good Company in Eugene (a sustainability research and consulting firm), and all different types of chemists of course." Next year's workshop will branch out even further, and include additional speakers from such disciplines as architecture, history, and medicine. —*Vanessa Salvia*

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GEMs Education Database and the Green Chemistry Education Network

In the summer of 2006, educators from Oregon, Idaho, Arkansas, and Massachusetts, coordinated by assistant department head Julie Haack, formed the Green Chemistry Education Network (GCEdNet) in collaboration with the American Chemical Society's Green Chemistry Institute. The leadership team for the network of educators has grown now to twenty faculty members from six states. The goal of the educators participating in GCEdNet is to coordinate curriculum development efforts across the country and foster collaboration and opportunities for mentoring and the synergistic integration of green chemistry in education. On March 25, 2009, *The New York Times* interviewed Julie Haack regarding her work on developing green chemistry curricula, and described the University of Oregon as a leader in the movement.

Haack designed the Greener Education Materials for Chemists (GEMs) database, a searchable, comprehensive resource of green chemistry education materials including laboratory exercises, lecture materials, course syllabuses, and multimedia content that illustrate chemical concepts important for green chemistry. GEMs was designed in collaboration with participants in GCEdNet; the database is free to anyone to use, content is constantly being expanded. This spring at the American Chemical Society meeting, Haack described new features of GEMs, including more than 100 items for educators in the database, which has expanded from a focus on organic chemistry to include green chemistry strategies in nanotechnology, materials sciences, biochemistry, and analytical chemistry. Doug Young, a doctoral student in chemistry at Oregon, has led the effort to increase the depth and breadth of the database. Undergraduate chemistry student Dana Garves has researched how GEMs has been used; she added a "Schools" tab in GEMs that allows educators to locate colleagues who have added green chemistry into their programs.

The GEMs database was designed in collaboration with the UO Interactive Media Group. The University of Oregon Department of Chemistry is a founding member of the GCEdNet. GEMs is supported by the NSF's Division of Undergraduate Education and the UO College of Arts and Sciences, the Instructional Technology Fellowship Program, and the Department of Chemistry. —*Vanessa Salvia*

Find out more about GCEdNet at www.gcednet.org, and the GEMs database at greenchem.uoregon.edu/gems.html.

2008 Hancock Award: Lallie McKenzie

Lallie McKenzie was honored with a Kenneth G. Hancock Memorial Award during her last year of Ph.D. studies in 2008. She earned her B.S. from the chemistry department in 2002; the following year, she received her master's in chemistry with a focus on polymers and coatings as part of the Materials Science Institute Industrial Internship Program.

The Hancock award is a national award given to graduate students who have shown success in green chemistry by applying green chemistry principles to their work; the award was a recognition of McKenzie's doctoral work. While working in the lab of Jim Hutchison, McKenzie focused on developing greener methods of generating nanoparticles. Among other things, McKenzie successfully produced higher yields of subnanometer gold particles with higher purity and product selectivity, a hundredfold increase in production rates and an 80 percent reduction in solvent waste.

Lallie McKenzie

McKenzie completed her Ph.D. in March 2009 and began a postdoctoral position at the UO's new nanoscience open-research initiative laboratory in the Lokey Lab facility. She is currently investigating nanomaterials for potential use in energy storage and generation. She began studying chemistry after a career as a middle-school teacher and several years as a stay-at-home mom.

Another student in the Hutchison lab, Scott Reed, received the award in 2000. "It felt good to bring it back home. I think it was very validating for the whole program here," she says, noting that the UO has long been recognized as a leader in the development of green chemistry curricula, but the research taking place here is sometimes overlooked. "This meant that we're broader than some people think."

McKenzie says that people are looking for things that help students, and green chemistry is one of those things. "Because people are able to see chemistry as . . . being able to change things in a positive way." —*Vanessa Salvia*

Green by Design: Green Nanoscience and SNNI

Jim Hutchison, long recognized as a leader in green chemistry, is also leading the charge for greener nanotechnology through the Safer Nanomaterials and Nanomanufacturing Initiative (SNNI). "Nanotechnology is an emerging technology and there's an opportunity to think about that technology before it becomes mainstream and see how it is that we might make that greener, cleaner, and safer from the beginning, rather than just letting that technology develop and then having to go in, years later, and clean it up, which is always more difficult and costly in the long run," says Hutchison, who is director of the SNNI,

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the Lokey-Harrington Chair in Chemistry, and associate vice president for research and strategic initiatives.

The SNNI is the largest research collaborator of the Oregon Nanoscience and Microtechnologies Institute, a cooperative venture among federal agencies, research affiliates, and educational affiliates from across the state of Oregon, created for the purpose of expanding research and economic development in the areas of nanoscale science and microtechnologies. The SNNI itself is a collaboration involving approximately sixty researchers from the UO, OSU, PSU, and the Pacific Northwest National Laboratory.

Hutchison says the goals of SNNI are to design materials with the desired performance that do not have long-term or short-term toxic effects on the environment and human health, to use efficient processing that does not generate a lot of toxic waste, and to apply those materials in a safe manner. “If you look at all the technology that nanotechnology is supposed to address—energy, clean water, health care, pretty much every industrial sector—many of those would have benefit for the environment,” says Hutchison. “But if we incorporate hazardous materials into them, if our ingredients aren’t clean, then we really have no way of attaining the benefit of clean technology. One example would be solar energy; the goal is a clean technology, harvesting light from the sun to have clean electricity. But if we, in the process of doing that, contaminate the environment by spreading toxic elements across the face of the planet, then we really haven’t accomplished the goal of clean energy.” —*Vanessa Salvia*

Find out more about SNNI at www.greennano.org.

Green Chemistry Around the World: Ken Doxsee’s International Activities

Ken Doxsee, associate vice provost for academic affairs and professor of chemistry, has become a leader in international green chemistry education. Doxsee has presented workshops and seminars in Thailand, Kuwait, and Israel, and jokes that he has been to Mexico so many times his colleagues at the Universidad Iberoamericana in Mexico City have named him “an honorary Mexican.”

Ken Doxsee, third from left, after an appearance on Good Morning, Kuwait.

At a sustainable microscale workshop in Mexico City, one of eight trips for workshops and labs he has taken there, a Catholic priest led a service directed to the chemists with the message that it was their obligation to make the world a better, safer place. Doxsee wholeheartedly agrees and says, “It ought to be that people are offended if someone doesn’t try.”

Despite the fact that Doxsee has not focused his career on microscale, he has been “sort of adopted” by the microscale community and has broadened his talks to recognize that microscale can be an element of making labs safer. Doxsee notes that these workshops lead to connections that lead to other opportunities to further the green chemistry outreach. He has visited Thailand three times to present workshops and attend international symposiums, and in January of 2008, he found himself sitting at a table waiting for the king’s daughter, HRH Princess Chulabhorn Mahidol, who has a Ph.D. in chemistry, to address the group. While waiting, he conversed about green chemistry with his newly met neighbor at the table, who, as it turned out, was the president of the Kuwait Chemical Society. One year later, in 2009, Doxsee led a workshop in Kuwait City, Kuwait, for sixty high school teachers from throughout Kuwait, joined by one of his Iberoamericana collaborators, Jorge Ibañez, and Nouria Al-Awadi, professor of chemistry and vice president for academic affairs at Kuwait University.

Sometimes, the experience of international travel is not so romantic. One conference exploring better ways to teach chemistry at the undergraduate level in Safed, Israel, in 2008 had to be rescheduled because missiles were bombarding the city.

No matter where on the globe Doxsee is when he is speaking about green chemistry, he sees a common thread. “It’ll sound hokey but I really believe this: they all believe that they can make the planet a better place by helping to train the next generation of students who won’t make the same mistakes that people of our generation have made,” Doxsee says. “People do care.” —*Vanessa Salvia*

Center for Green Materials Chemistry: Cutting-Edge Science and Breakthrough Technologies

Two University of Oregon chemistry researchers and two Oregon State University researchers are collaborating on the Center for Green Materials Chemistry. The National Science Foundation–sponsored Centers for Chemical

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Innovation Phase I (CCI) program was one of three centers awarded nationally from scores of applicants. The CCI program provides financial support to "major, long-term, fundamental chemical research challenges," according to an NSF publication (www.nsf.gov/pubs/2009/nsf09597/nsf09597.htm).

The center combines the talents of Darren Johnson, UO associate professor of chemistry, who has developed unique methods for making metal oxide clusters of early main group metals; OSU's Douglas Keszler, who has developed novel solution-phase chemistry that allows for the formation of fully dense films from aqueous solutions; David Johnson, UO professor of chemistry, who has developed novel approaches to characterize thin films; and John Wager, OSU professor of electrical engineering, who makes novel devices with the films produced by center researchers. David Johnson provides flat-panel display televisions and photovoltaic panels as an example of devices in which the research could be utilized. Flat-panel technology currently uses a subtractive technology to deposit film everywhere and remove it where it isn't needed, and it's done in a vacuum. "The technology developed in the center allows you to, first, not do it in a vacuum, it's done in an open system, and second, do it in an additive sense, so you can print the wire where you want the wire to be, which is much more efficient."

The center is submitting a proposal to be funded through phase two. The National Science Foundation anticipates as many as two centers will be awarded phase two funding of as much as $5 million per year for five years. The collaborating researchers have been "working like mad" to obtain the necessary results to compete successfully for phase two funding.

David says current semiconductor processing technologies require large amounts of money to purchase the necessary processing equipment. "If you have a great idea, it's very difficult to realize your great idea because you need large amounts of funding to buy the equipment," David says. "Realizing the technical objectives of the center will be a revolution in consumer electronics. If you eliminate the barrier of start-up costs so that the guy with a great idea can go to his garage and build prototypes, it will change the competitive landscape." —*Vanessa Salvia*

Find out more about the Center for Green Materials Chemistry at greenmaterials.uoregon.edu.

Cross-Country Bicycle Exodus

Going green is a philosophy that can start with many lifestyle choices and then carry over to the laboratory. David Walla, a first-year Ph.D. student in chemistry, exemplifies that. Walla just moved here from Cincinnati, Ohio, but rather than making the road trip with a car laden with dorm gear, he made the move by bicycle.

Walla and three other friends set out as a group, but only two of them made it. "Two of our friends stopped in Salida, Colorado, fell in love with it, and tried to get jobs at a farm there," Walla says, but two of them made it all the way to the West Coast.

The group left Cincinnati on July 2 and arrived at their destination on August 26. Walla carried "not a whole lot," he says: two bike packs, a rack, bedding, a hammock, a couple changes of clothes, extra shoes, and some tools.

In Cincinnati, where Walla grew up, his only mode of transportation was a bicycle. "I lived on my bike and loved everything about bike culture, and when I found out I got into the University of Oregon, I figured [biking] was just a natural way to get out there," Walla says. "I always wanted to do a really long ride and this was the best chance I'd get. One last little bit of freedom before grad school."

David Walla on his cross-country bicycle journey from Cincinnati, Ohio, to Oregon.

Walla says he anticipated that he might be a little frightened about leaving his hometown and sleeping in a different, unfamiliar place every night. "I had the feeling that the whole world was suspicious and out to get you," he says, "but everywhere we went there were farmers offering us food, and people offering us places to stay, and if we had a bike break down, someone would give us a ride to a bike shop. I was amazed by the hospitality and the friendliness of strangers."

Walla was attracted to the UO chemistry program through a professor at the University of Cincinnati who had worked with the UO's green chemistry leader, Jim Hutchison. "Hearing about all the environmental chemistry that was going on really attracted me to the UO, and also I just had hundreds of people tell me that they thought I'd really like Oregon. So I checked it out and I'm already loving it." —*Vanessa Salvia*

Faculty Awards

Fund for Faculty Excellence

Since 2007, four Department of Chemistry faculty members have been honored with the UO Fund for Faculty Excellence award (FFE). The fund was established in 2006 by an anonymous gift to Campaign Oregon: Transforming Lives. During the second year of the awards program, it was revealed that Lorry I. Lokey was the previously anonymous donor; Lokey has donated $10.4 million to the program.

Chemistry professors Mike Haley and Jim Hutchison received the award the first year, for academic year 2006–7; chemistry professors Jeff Cina and Vickie DeRose received the honor for academic year 2007–8.

"Wearing two hats, I certainly see the importance of the award," says Mike Haley. "As department head, the FFE award allows us to recognize members of the outstanding UO faculty who are both excellent teachers and researchers, things that do not necessarily go hand-in-hand. This is a way to recognize excellence "in-house" before a faculty member might be lured away by a competing school. The fact that chemistry has four FFE award winners out of the circa fifty awards is an impressive feat. As an award winner, it made me feel that all the hard work I have put into my career at the UO is truly valued."

Inorganic spectroscopist Vickie DeRose says that receiving the award "was a huge surprise." Then department head Tom Dyke went to DeRose's office and told her that she had forgotten to check her mailbox, and handed her the envelope. "It was a thrill," DeRose says. "I had just recently moved here and actually was still feeling somewhat unsettled, and receiving a UO award at that time was particularly meaningful to me. A great outcome of this award is that it can be inspirational when work gets challenging. One thinks, 'Oh, but they thought I was good enough for an award! Get moving!' The difficult side of this particular award is that there are an awful lot of other faculty members who also deserve one, and for whom it would also be quite meaningful." —*Vanessa Salvia*

Research Innovation Award: David Tyler

Chemistry professor David Tyler was honored in a June 4, 2009, ceremony in which he received one of eight University of Oregon

David Tyler

Research Innovation Awards. The Office of the Vice President for Research and Graduate Studies launched the annual Research Innovation Awards in 2005 to honor UO scholarship and achievement. Each year, the award honors excellence within a different focus; this year's theme was "Science and Innovation."

The award recognized and honored Tyler's research excellence in general, throughout the many areas of research he is engaging in. Notably, Tyler's lab studies plastics that degrade on exposure to sunlight, and water-soluble reaction catalysts. "Industrial processes are catalyzed but a lot of those processes don't occur in water because none of the reactants are water soluble, including the catalysts," Tyler explains. "We've made a lot of catalysts water soluble, so over the years we've investigated catalytic reactions in water and compared them to their counterparts in nonaqueous solvents. "

Tyler has recently been focused on improving an industrial process for making poly(methyl methacrylate)—Plexiglas is one example of this polymer—by reacting acetone cyanohydrin with water to make a precursor for methyl methacrylate. In current production, every pound of methyl methacrylate results in 2.5 pounds of ammonium hydrogen sulfate. "We're working out a way to do this process in water instead of in nonaqueous solution," Tyler says. "You save a lot of energy because you don't have all of the waste product that is formed like when you do it by the old route."

Tyler received a $1,000 award, and is thrilled by the recognition and the commemorative inscribed glass plate, handmade by a local artisan, that he received. "It's all very much appreciated," Tyler says. "To be recognized by your peers is very nice." —*Vanessa Salvia*

Geraldine Richmond Honored with Guggenheim, Bomem-Michelson Awards, and More

Geri Richmond, the Richard M. and Patricia H. Noyes Professor of Chemistry, received a Guggenheim Fellowship in 2007, the Bomem-Michelson Award in 2008, and she has been selected as a 2008 fellow of both the Association for the Advancement of Women in Science and the Society of Applied Spectroscopy. Of the 2,800 artists, scholars, and scientists who ap-

Geri Richmond

plied for the Guggenheim Fellowship, 189 were selected, and of those, only two were chemists. The Guggenheim allows recipients to take a year's sabbatical to focus on their research. Richmond's physical chemistry work involves surface and interface research with an environmentally sustainable focus. Recent published research includes "From Franklin to Today: Toward a Molecular-Level Understanding of Bonding and Adsorption at the Oil-Water Interface"

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In Memoriam

Charlotte Schellman, Molecular Biologist, 1922–2008

Frances Charlotte Green Schellman was born in Saint Joseph, Missouri, in 1922 to Dudley Green and Julia Reichhelm Green. Her family moved to Pasadena, California, in 1940. She started at the California Institute of Technology as an undergraduate assistant in the general chemistry labs but soon was working on a smokeless powder research project in Linus Pauling and R. B. Corey's lab.

She received a bachelor's degree in chemistry from UCLA and a doctorate in physical organic chemistry from Stanford. She then returned to Cal Tech for postdoctoral research, where she worked on protein sequencing. After three years at Cal Tech she received a Polio Foundation Fellowship for postdoctoral study at the Carlsberg Laboratory in Copenhagen, Denmark.

Charlotte married John Schellman in 1954. They moved to the University of Minnesota in Minneapolis in 1955, where daughter Heidi was born, and then to the University of Oregon in Eugene in 1958, where her other daughter, Lise, was born. John became a professor of chemistry while Charlotte had an adjunct associate professorship. She was a member of the Institute of Molecular Biology and the first woman professor in the physical sciences at the University of Oregon.

Charlotte continued her work on the prediction of protein structure, working out the relationship between amino acid sequences and the shapes of protein molecules. Her contributions to the field have been recognized by the assignment of the name "Schellman motif" to a common termination for alpha helices. She retired from the University in 1987, but continued to do research and speak about her work until she was diagnosed with pulmonary hypertension in 2000. Her last work was an explanation of the underlying mechanism of a widely used instability test for mutant proteins.

Charlotte's other interests included cooking, archeology, needle arts, and politics. She was a strong supporter of the arts in Eugene and a patron of the opera, symphony, and ballet. At the University of Oregon she was active in Sigma Xi, serving as chapter president, and an important advocate for women in science. She is survived by her husband, John, daughters Heidi, of Wayne, Illinois, and Lise of Eugene, Oregon, and a grandson, Blaise. *—Lise Schellman*

Warner Peticolas, Chemist and Spectroscopist, 1929–2009

Warner Leland Peticolas was my friend and colleague for forty-two years at the University of Oregon. He was an accomplished chemist with a considerable reputation when he arrived as full professor in 1967, and that reputation only increased with time.

Warner received his B.A in chemical engineering in 1950 from Texas Technological University in Lubbock, his hometown. He attended Northwestern University for graduate work and received his Ph.D. in 1954 under the direction of Irving Klotz. Following that, he accepted a position with the National Institutes of Health.

After several years at the NIH and then at DuPont, he took a new position at the research labs of IBM in San Jose, California. It was there that he developed an interest in spectroscopy, a field rather far from his previous work. Laser spectroscopy at that time was fairly new, and was being intensely developed. Warner entered this field with enthusiasm, and decided to study the two-photon absorption of naphthalene. He recalled that some experts told him that it couldn't be done (for experimental reasons), but he persisted and obtained the first two-photon spectrum of an organic molecule.

In addition to the experiment, he worked out the theory. He was aware that the basic theory of two-photon spectroscopy had been developed by Maria Goeppert Mayer in 1929, but it was not possible to see the effect experimentally before the invention of lasers. Warner used a different method than did Goeppert Mayer and, of course, got the same answer. He sent his calculations to Goeppert Mayer and got a very nice answer saying that his way of doing the work was perfectly correct, but that she already knew of it. In fact she had solved the problem both ways in her doctoral thesis, but only published one of them. Warner was very pleased that he could independently duplicate the work of such an outstanding physicist.

After his successful recruitment by Oregon in 1967, his interests shifted to laser Raman spectroscopy of macromolecules, particularly proteins and nucleic acids. After entering this new field, he became one of its leading practitioners, with many graduate students and postdocs.

Warner participated fully in the teaching mission of the chemistry department. He taught at all levels, from first-year courses to advanced graduate courses. I had the pleasure of teaching the freshman course at the same time as Warner (different sections) and team-teaching with him a course in group theory applied to chemistry. He was a good teacher.

Warner served as visiting professor at Cal Tech, the Institut Laue-Langevin (France), Université de Paris 6, and the Universität Stuttgart. He spoke good French (with a strong Texas accent), and had an apartment in the Marais section of Paris for a number of years.

He was also an accomplished pianist. In his teens he played jazz gigs in Lubbock to earn money. Later, he concentrated on classical music on the piano and harpsichord. He even wrote some electronic music, including one piece based on notes that were the normal frequencies of a molecule (carbon tetrachloride, if I remember correctly), scaled down to the audio range—a spectroscopist to the end. He was an enthusiastic opera fan, and was especially fond of Wagner. He traveled extensively to hear performances of the *Ring* cycle.

Warner died on June 26, 2009, just a month short of his eightieth birthday. He is survived by his first wife, Patricia Schleich, his wife, Virginia, five children, and ten grandchildren. Warner had an open nature, an appreciation of life, and a host of friends. We shall all miss him. *—Robert M. Mazo, Professor Emeritus, Institute of Theoretical Science, University of Oregon*

My Love Affair with the UO

[Editor's note: Since 1986, Mordecai Rubin has been a frequent collaborator with researchers here at the University of Oregon, including Richard Noyes and Ralph Barnhard. Here, Rubin looks back fondly at his time spent in the University of Oregon chemistry department.]

In the twenty-three years that have elapsed since my first visit to the UO chemistry department in 1986, I have spent a total of forty-one months, nearly three and a half years, as a research associate in Eugene. This is probably some kind of record—it even got me into the PERS system. As I wrote this summary of my relationship to the chemistry department, I came to realize that it was really the story of a romance, and a very happy one at that.

It all began with a half sabbatical from the Technion in spring 1986 with two factors combining to bring me to Eugene. First of all, an aunt, born in Portland, had been singing the praises of God's country (Oregon) for as long as I had known her. And second, I had been working in organic photochemistry for more than thirty years and thought that it might be interesting to look for oscillating phenomena in photochemical reactions. Obviously, the University of Oregon was the place to go for a background in oscillating reactions, particularly since I had known Dick Noyes when he was a young instructor at Columbia and I was a graduate student. Dick and I agreed on a four-month appointment, and I arrived in Eugene at the beginning of February 1986 with my wife following a short time later.

I learned an important lesson that February—don't come to Eugene in February. It rained every single day—cold, dark, and wet, with a total of fourteen inches for the month. In subsequent years we spent mostly summers in Eugene and it would be hard to find a better combination than Eugene in the summer time and Haifa the rest of the year. And so I arrived in Eugene, found Dick in his minioffice on Onyx Bridge, and settled down to lab work and the world of oscillating chemical reactions. The department has left shiny bronze plaques on that office door, since eventually I and later Ralph Barnhard occupied that room. Dick never threw anything out and his lab was a collection of largely historic items of apparatus, but it did include a fantastically sensitive pressure transducer that eventually was computerized using a program written by Eric Bylund. Another important lesson quickly learned was that the world of oscillating reactions was not for an organic chemist like me. Knowing one's limitations is an important thing. As it turned out, the problem, which Dick presented me with, was not an oscillating chemical reaction at all; it was an oscillating physical process.

Earlier work by Ken Smith in Dick's lab had shown that a gently stirred aqueous solution of ammonium sulfate, sodium nitrite, and sulfuric acid (the classical diazotization reaction stripped to its barest essentials) emitted intermittent bursts of nitrogen gas at time intervals. A quiet period was followed by a vigorous burst of gas, then quiet, then another burst, and so on. Dick thought this might be due to the evolving gas sweeping out some volatile catalyst which then built up again to produce another burst of gas, and so on. I was able to show that this was not the case. The correct explanation was that the gas concentration in solution built up to a limiting, reproducible value, which then emitted a burst of gas, and so on until the reactants were consumed. The oscillating gas evolution was a strictly physical phenomenon arising from limiting supersaturation. We were able to establish limiting supersaturation values for nitrogen, oxygen, hydrogen, and carbon dioxide. The pressure transducer allowed one to monitor the pressure changes quantitatively. Less than four months in Eugene resulted in the publication of two joint papers in *The Journal of Physical Chemistry* describing the above study.

My wife and I had a lovely time in Eugene, where life was very pleasant indeed. We made some good friends, and there was a lot of music and theater and delightful trips in all directions. There is not very much English theater in Israel, and we two theater buffs went to any dramatic production we could find almost anywhere in Oregon, even to high school productions (we left one at the intermission). Dick Noyes was a pleasure to work with; we had opened up a new method for quantitative study of the liquid-vapor interface. Dick had a custom of circulating his professional correspondence among his coworkers, and I remember a letter in which he commented that it wasn't easy at his age (he was already retired) to enter a new field.

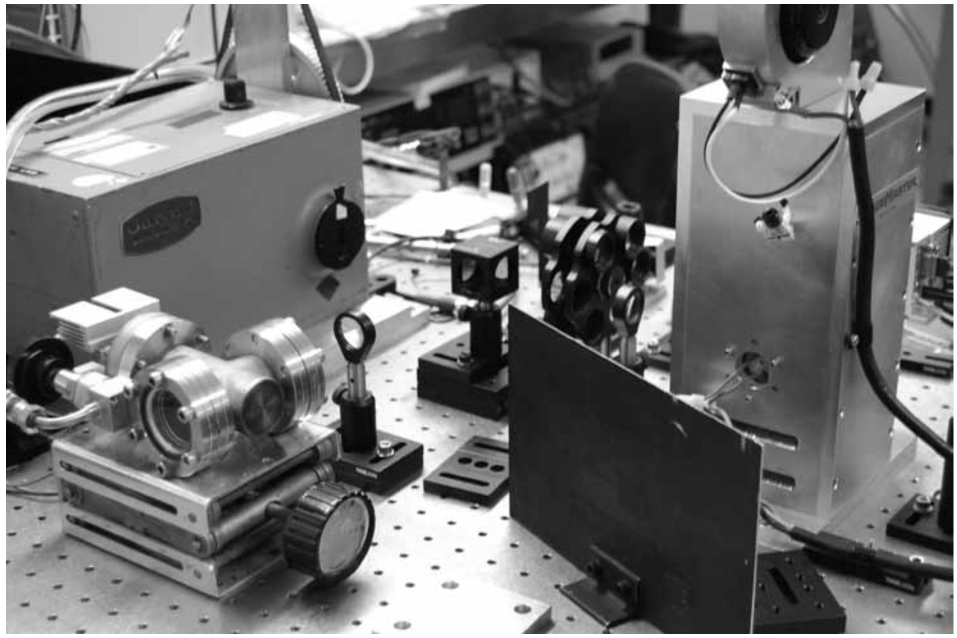
Mordecai Rubin

It was easy to decide to go back to Eugene in 1989 for the second half of the sabbatical that had begun in 1986, this time for a five-month stay. Given a convenient method for kinetic studies, we investigated a variety of aspects of the gas-liquid interface, and a paper on this subject appeared in due course, together with one proposing an alternate model for transport of molecules between gas and solution. This last paper provided an example of Dick Noyes at his battling best. The referees' reports were venomous, probably partly because Dick derived things from first principles and did not bother to cite earlier work of others. At least half a dozen referees recommended that the paper not be published. But Dick Noyes had been an associate editor of *The Journal of Physical Chemistry* and had recently been singled out for a special issue in honor of his seventieth birthday. He kept on fighting, introduced some conciliatory phrases, and a third group of referees was selected. After over a year of hostilities, the paper was finally accepted. The Bitnet communication system was in place by that time and Dick and I were able to keep in good contact while all this was going on.

The next time I could get away was in 1992, and from then on my wife and I returned in spring or summer for two or three months or more with the exception of 1996 and 2007. I gave courses on organic photochemistry and the history of chemistry and became a familiar face in the department. Peter Bowers from Simmons College was another regular in Dick's lab; no one below the rank of full professor could be admitted.

In 1994 I became professor emeritus in Haifa, and about this time Dick Noyes' fatal illness had incapacitated him. He died in 1997. *[Editor's note: See our 1997 newsletter for a remembrance of Richard Noyes and the establishment of the Richard M. Noyes Physical Chemistry Achievement Award: darkwing.uoregon.edu/~chem/newsf97.pdf]* By then we had published six papers, and a couple more might have resulted under happier circumstances. The last published work concerned the rate of solution of carbon dioxide in aqueous media including simulated seawater, and is of some relevance to present greenhouse problems. Additional work on the rates of evaporation of various liquids was never completed.

Trips to Eugene continued with annual appointments as courtesy research associate. After my retirement, I began studying the history of ozone and have published seven papers with more on the way on various aspects of ozone history; much of the library work was done in the Science Library



at the UO. And so, with the help of Ralph Barnhard followed by Julie Haack and the various department heads over the years, I have been coming back to Eugene almost every year as a courtesy research associate. The department gives me desk space, use of a computer, faculty privileges, and a big welcome. I spend most of my time in the Science Library, where talented young librarians can find anything for you and do it with great goodwill. There is a curious library puzzle to which I have never found the answer: The UO only began awarding a Ph.D. degree in chemistry after World War II, but how is it that the library is excellent, with many chemistry journals going back to their very first issue? No one seems to know the answer.

My decision to go to the UO in 1986 has turned out to be one of the best decisions of my life. It has given me much scientific pleasure, allowed me to enjoy the ambiance of one of the loveliest spots in the world, and given me some good friends—a home away from home. Who could ask for anything more? I close with part of the acknowledgment in a recent published ozone paper (Ozone VI): "We thank the Department of Chemistry, University of Oregon, Eugene, for its continuing hospitality. If a guest is a jewel in the crown of hospitality (Nero Wolfe), the Eugene department is indeed a crown." —*Mordecai B. Rubin, Professor Emeritus, Department of Chemistry, Technion, Israel Institute of Technology, Haifa, Israel*

Faculty Awards

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(C. McFearin, D. Beaman, F. Moore and G.L. Richmond, *The Journal of Physical Chemistry C*, 113, pp. 1171–88, 2009).

The Bomem-Michelson Award is dedicated to the memory of Professor A. E. Michelson, developer of the Michelson interferometer. The award honors a scientist who has advanced the techniques of spectroscopy. Professor Richmond's award recognizes her contributions to the field of molecular spectroscopy through the use, development, and advancement of nonlinear optical methods to study molecular structure and interactions at complex surfaces and interfaces.

In October 2009, Richmond will receive an honorary membership in the Society for Applied Spectroscopy. In addition to the eleven distinguished lectureships Richmond has given around the country since winning the Guggenheim, with more upcoming, she is also director of COACh—Committee on the Advancement of Women in Chemistry. The more than 400 COACh members are interested in making institutional changes that will lead to an increase in the numbers and success of women in science and engineering. Through collaborations and education, COACh members have trained 4,000 professionals, helping them achieve in science and leadership. —*Vanessa Salvia*

Find out more about Professor Richmond and COACh at richmondscience.uoregon.edu.

Alumni News from All Over

1940s

[Editor's note: Marion Hill penned a three-part memoir, which was published in the 1995, 1996, and 1997 chemistry department alumni newsletters: darkwing.uoregon.edu/~chem/newsf95.pdf, darkwing.uoregon.edu/~chem/newsf96.pdf, darkwing.uoregon.edu/~chem/newsf97.pdf. Hill received a UO Alumni Achievement Award in Chemistry in 1996 for his outstanding career.]

Marion Hill '48, M.A. '50, finished his master's degree research in 1949, when the post–World War II economy was in its first recession. Lack of job opportunities in the west led to Hill accepting an appointment from the National Bureau of Standards in Washington, D.C., in thermochemistry at a salary of $2,700 per year. Because his interests lay in organic chemistry, he soon transferred to the Naval Ordnance Laboratory (NOL) in Silver Spring, Maryland. There he was engaged in basic research in the synthesis of nitroaliphatic and nitroaromatic compounds aimed to improve post–World War II weapons. A highlight of his research at NOL was the discovery of a new class of nitroaliphatic plasticizers, one of which was bis(dinitropropyl) formal (BDNPF) that, in the Polaris missile's rocket motor composition, contributed to increasing its range by 1,500 miles. This plasticizer was successfully applied to warhead compositions and has become widely used. Variations of the structure and the synthesis processes have been actively researched until today. Serendipitous observations led to discovery of a new class of explosives, nitroorthoesters, exemplified by trinitroethyl orthocarbonate and other structural variations such as bis (trinitroethyl) carbonate. Research in the synthesis and applications have been studied ever since.

While running a reaction for proof of structure a new nitroaromatic explosive, triaminotrinitro benzene (TATB) was isolated. It is a high-density, heat-stable, insensitive compound with more energy than TNT. It is still being studied today in warhead applications and may soon replace more sensitive dangerous explosive compounds in warheads.

Hill received many awards and honors for his work, including the Meritorious Civilian Service Award; a Superior Accomplish Award and unusual cash prize of $5000 for the discovery of the nitroplasticizers; a one-year fellowship at Pennsylvania State University for advanced study; and Award of Merit for Group Achievement.

Hill moved to Stanford Research Institute in 1960 (now SRI International) and continued work in the nitro chemistry field. He established the chemistry laboratory of the Physical Science Division and increased its staff of forty in organic and polymer chemistry to five chemistry subdisciplines and 115 staff members. He was its director for seventeen years until retirement in 1984. At SRI he received six annual awards for superior service.

After retirement, Hill consulted for a few years, primarily highlighted in 1985 by a three-month assignment with the International Executive Service Corps to establish a research-and-development group in Indonesia's Ministry of Science. He also consulted with the government of Taiwan's research center in high-energy plasticizers in 1986.

Eventually, Hill left consulting and intensified international travel with his wife, Susan, to England, Europe, the South Seas, Asia, and North America until her passing. Since then he has emphasized writing family histories based on decades of genealogical research and enjoying his families of three children, seven grandchildren, and ten great grandchildren.

In retirement, Hill received the University of Oregon Alumni Achievement Award in Chemistry in 1996, and was inducted into the SRI Alumni Association's Hall of Fame in 2003.

1950s

Gary Christian '59 is emeritus professor of chemistry at the University of Washington. He maintains an office and continues as editor in chief of the journal *Talanta*, now in his twenty-first year. He is an American Chemical Society tour speaker, and remains professionally active with international collaborations and speaking engagements. His textbook, *Analytical Chemistry*, is in its sixth edition. His awards include the ACS Fisher Award in Analytical Chemistry and the ACS Division of Analytical Chemistry Award for Excellence in Teaching. He and his wife of forty-eight years, Sue, live in Medina, Washington, and just became empty nesters as their granddaughter, Taffy, who they raised along with her sister, Tanya, headed off for college. Tanya is a junior Oregon Duck!

1960s

Friedhelm "Fred" Baitis '68 says that after graduation, the Vietnam War took control of his life. The result was a twenty-year career in the U.S. Air Force flying fighter jets, and then a second career at TWA and United Airlines. Baitis retired again in 2005, and is spending his days traveling, skiing, camping, and fishing at Steamboat Springs. "Rough life, but someone has to exercise the trout," Baitis says.

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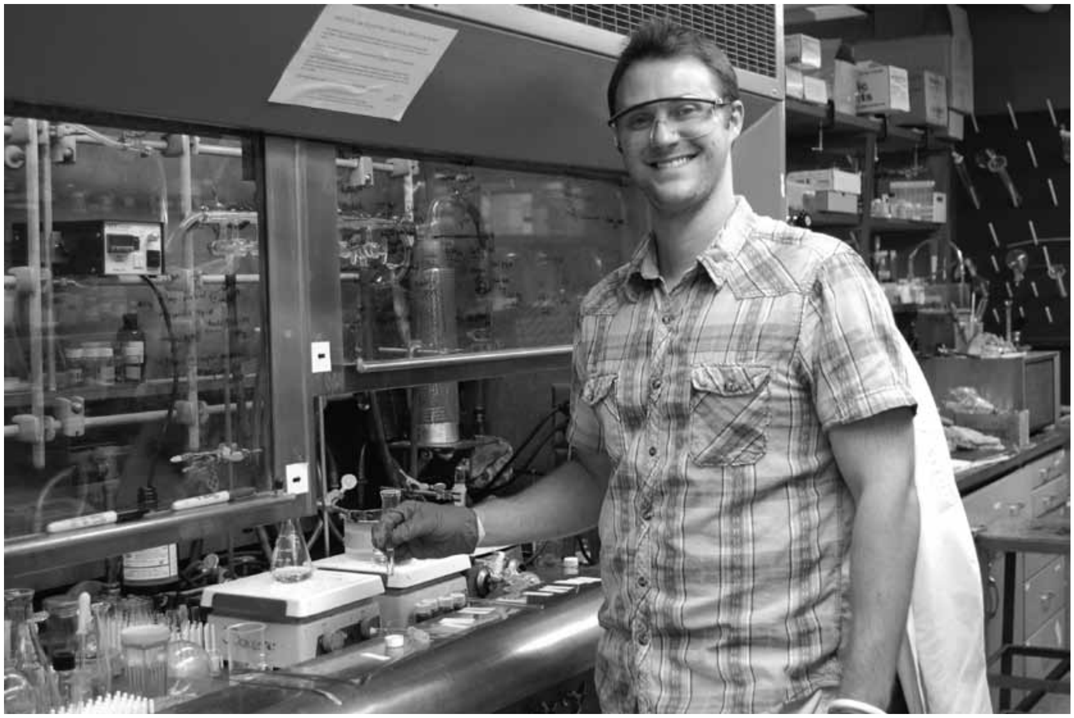
Dennis Clark ’66 graduated with his Ph.D. in organic chemistry in 1971 from Stanford University, and in 1973 became director of the Drug Assay Lab at Stanford University Medical Center. From 1980 to 1991 he worked as a clinical chemist at Stanford University Hospital; from 1986 to 1998 as founder and lab director at Analytical Solutions, a pharmaceutical contract research lab; from 1998 to 2002 as a senior scientist at MDS Pharma Services. Clark retired in 2002 and is the happy, involved grandfather of four girls and an avid sports car racer in Northern California.



Graduate student Doug Young working hard in the Doxsee lab.

The following is a brief career summary submitted by **Gordon Gribble***, Ph.D. ’67.*

The four years I spent there in Oregon were the best four years of my life. I miss Oregon tremendously. As I begin my forty-first year at Dartmouth in Hanover, New Hampshire, here is my news: My new book, *Naturally Occurring Organohalogen Compounds: A Comprehensive Update*, is about to be published. This is a book I finished during my 2006–7 sabbatical year at Gettysburg College as a research fellow in chemistry and Civil War–era studies. This book is a sequel to one I wrote in 1996.

During this sabbatical leave, I also researched and wrote an article for *Civil War Times* on my great, great granduncle, Lt. Horatio Lewis of the 145th PA infantry, who was killed during the battle of Gettysburg. He was the brother of my great, great grandfather. I have had a keen interest in the battle of Gettysburg for many years. Another distant uncle, Horatio’s brother, Sgt. Harry Lewis of the Sixth U.S. Cavalry, was captured by the Confederates at Gettysburg and spent six months in Libby Prison in Richmond, Virginia.

For the past fourteen years I have been the coeditor of *Progress in Heterocyclic Chemistry*, and I am on the editorial board of the electronic journal *Arkivoc* and the journal *Current Organic Chemistry*. The second edition of our book, *Palladium in Heterocyclic Chemistry*, was published in 2007. In 2004, I was elected to my Abraham Lincoln High School “Wall of Fame” in San Francisco, and in 2006 I was awarded the Dartmouth Arts and Sciences Graduate Faculty Mentoring Award. In 2005, I was named to the inaugural endowed chair, Dartmouth Professor of Chemistry. In 1998, I received the University of Oregon Alumni Achievement Award in Chemistry.

As a home winemaker for thirty-one years, I am currently ranked among the top twenty-five national amateur winemakers as determined by the American Wine Society. Of more than 100 awards and medals, my 1995 petite Syrah won Best Vinifera and Best of Show at the National American Wine Society Conference in 1998, and my 1995 Cabernet blackberry port took a Double Gold Medal and Best of Show at the 1998 Connecticut Amateur Wine Competition. Finally, I am currently writing a new book, *Indole Ring Synthesis: From Natural Products to Drug Discovery*.

Celeste Hennies Roper ’62 moved to China Lake, California, and worked in the technical library of the Naval Ordnance Test Station for three years. She “retired” and raised two sons. When the sons left home, she returned to the China Lake base, now called the Naval Air Warfare Center (NAWC), and worked in a group called Materials Engineering. Celeste helped specify nonmetal materials for weapons systems designed by the Navy, having worked on the Sidewinder, Tomahawk, and Sparrow programs. In 1993, Celeste was involved in the efforts to remove all chlorofluorocarbons (CFC) from use by the Navy. Due to executive order, the government could no longer require the use of CFCs because of damage to the ozone layer. Celeste then moved to the chemistry research department of NAWC to help with the work of finding replacements for the CFCs. As a result of that work, when she retired in December 2002,

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Alumni News from All Over

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she received the Navy's Meritorious Service Award.

Wayne M. Stalick '64 has retired from his position as chair of the Department of Biochemistry Chemistry and Physics at the University of Central Missouri as of June 30, 2009. He is currently pursuing his research interests through the Center for Alternative Fuels and Environmental Systems, a center associated with UCM (see www.protostardesign.com/cafes). He will be the director of the biofuels division and will be acting as a consultant for those seeking advice in that area.

The following is a brief career summary submitted by **John Winkelman** *'62.*

Following graduation, I spent several years in the pulp and paper industry, first with Weyerhaeuser at Springfield, then with Boise Cascade at Wallula, Washington, working in the technical departments of both companies at positions normally held by chemical engineers, not chemists. I left Boise Cascade with thoughts of pursuing an advanced degree in chemistry, but those thoughts passed and I joined Tektronix in Beaverton as a material evaluation engineer, later transitioning to the environmental test department. After a promotion to department manager, I decided that corporate management was not for me and commenced what would become another zig or zag in my career path: I entered an evening law school program at Northwestern School of Law.

After graduating (from Lewis and Clark, which in the interim had acquired the law school) and passing the bar exam, I sought a career that would make use of both my technical and legal training. That turned out to be patent law. On the advice of Tektronix' outside patent counsel, I applied to become a patent examiner in the U.S. Patent and Trademark Office. After being accepted, I left Tektronix, moved to the Washington, D.C., area, and worked as an examiner in the chemical field for several years—long enough to learn the basics of patent law and also to learn that I didn't want to do that forever. Luckily, I was offered a position in a Portland patent law firm, and moved back to Oregon to practice patent law. My final significant career move came four years later, when I returned to Tektronix, this time as patent counsel in the law department. I formally retired from Tektronix twenty-eight years later, in 2002, but have continued to do legal work for the company as a consultant on a part-time basis.

1970s

Tim Rolfe '75 earned his Ph.D. in theoretical physical chemistry from the University of Chicago in 1982, and held a postdoctoral position at MIT in 1983. Rolfe became assistant professor of Computer Science at Gonzaga University, a position he held from 1983 to 1987. He earned an M.S. in computer science from the University of Minnesota in 1989, and was assistant and associate professor of computer science at Dakota State University from 1990 to 1998. Rolfe is presently professor of computer science at Eastern Washington University. Further information at penguin.ewu.edu/~trolfe.

Ron Stenkamp '70 and **Larilyn Zeller** '70 married soon after graduating from Oregon and immediately started graduate school in chemistry at the University of Washington. They both received their Ph.D.s in 1975, Larilyn in quantum chemistry and Ron in protein crystallography. After spending two years in the east, they returned to Seattle, where Ron joined the faculty at UW in the Department of Biological Structure. Larilyn has since retired, but Ron continues his protein crystallography research at Washington.

1980s

Paul Yager, Ph.D. '80, is a native of Manhattan, and received his A.B. in biochemistry from Princeton in 1975. At UO, he specialized in vibrational spectroscopy of biomolecules. After an NRC Fellowship at the Naval Research Laboratory from 1980 to 1982, he joined the NRL staff as a research chemist. He joined the Center (now Department) of Bioengineering at the University of Washington as associate professor in 1987, advancing to professor in 1995. Since 1992, Yager has focused on development of microfluidics for the manipulation of biological fluids. The primary goal of current work in the Yager lab is development of point-of-care biomedical diagnostics for the developed and developing worlds. In 2005, Yager was awarded a grant of $15.4 million from the Bill and Melinda Gates Foundation under support of their Grand Challenges in Global Health initiative; the collaborative team at

Paul Yager

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UW, Micronics, Epoch Biosciences, and Path is developing a low-cost rugged point-of-care system based on microfluidics for disease diagnosis. He has authored more than 180 research publications, and has more than thirty issued U.S. patents. Specifics are at faculty.washington.edu/yagerp. Since 2008, Yager has served as chair of the Department of Bioengineering.

2000s

Eric Hoidal ’03 graduated in June 2003, and following that, he attended Creighton University School of Dentistry and graduated in May 2007. Eric is currently living in Boise, Idaho, and practicing dentistry there.

Shea Johnson ’00 lives in Oakland, California, with her fiancé (a non-UO alum). Johnson works as a program manager for the Molecular Business Unit of Siemens Healthcare Diagnostics. She earned a certificate with distinction in project management from UC Berkeley Extension in 2008 and obtained the project management professional (PMP®) credential in 2009.

Brian Nebrensky, M.S. ’06, lives in Portland, Oregon, and has been working for Intel Corporation in the D1C fabrication facility in Hillsboro, Oregon, ever since graduation. He won two D1C divisional awards from Intel.

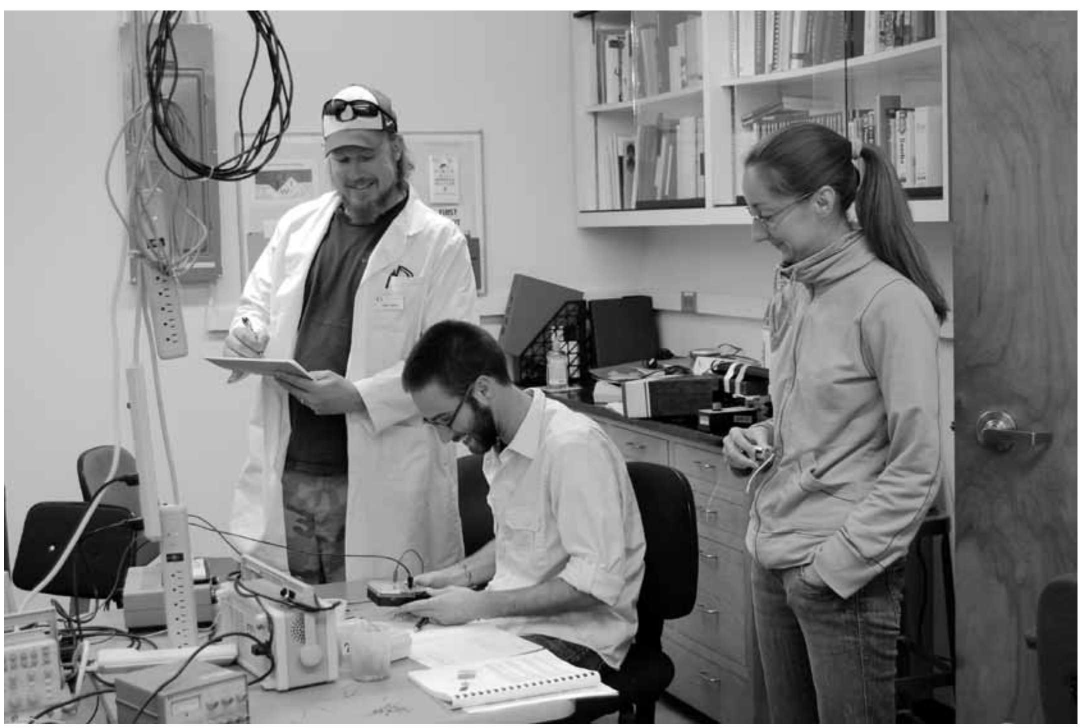
Michael Pluth ’04 received his Ph.D. in chemistry from UC Berkeley (working for Ken Raymond and Bob Bergman) in 2008 and received the American Chemical Society Division of Inorganic Chemistry Young Investigator Award in 2008. He is currently living in Cambridge, Massachusetts, and is an NIH postdoctoral fellow at MIT, working for Steve Lippard. In the Lippard lab, Pluth is working on designing water-soluble fluorescent probes for detection of nitric oxide that can be used to detect nitric oxide produced in live cells. Pluth explains, “Although it is a gas, nitric oxide is an important cellular messenger, and there is much interest in designing probes for its detection in order to further our understanding of its role in biology.”

Christopher Sweeney, M.S. ’01, went on to the University of Washington School of Law and became a patent attorney with Knobbe Martens, the largest intellectual property firm on the West Coast. Sweeney’s practice includes mostly chemical, pharmaceutical, and biotech inventions. After four years in their San Diego office, Sweeney helped the firm open a Seattle office last year. They now have six attorneys and are moving into expanded office space as of August.

Christopher Ward ’05 graduated in 2006 from the Materials Science Center in Polymer Chemistry. He worked as a polymer chemist at Advanced Color Systems for about a year before joining the Peace Corps. He now lives in Constanza in the Dominican Republic, where he works with the high school giving lectures about environmental science in the natural science classes. Ward works with youth doing HIV and AIDS education as part of a United States Agency for International Development initiative and the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR). He also works with American doctors and engineers to provide access to medical care and safe drinking water for the people of the small villages surrounding the town.

Ryan Wiser ’08 is currently working for Iris Vineyards in Cottage Grove, Oregon, doing chemistry in the facility’s new winery and lab. This will be Wiser’s second harvest with Iris, his first being immediately after graduation in 2008.

Information for Alumni News from All Over was gathered by Vanessa Salvia.



First-year grad students Jason Hackley, Phil Kovac, and Sheila Hurley prepping a P-chem lab experiment.

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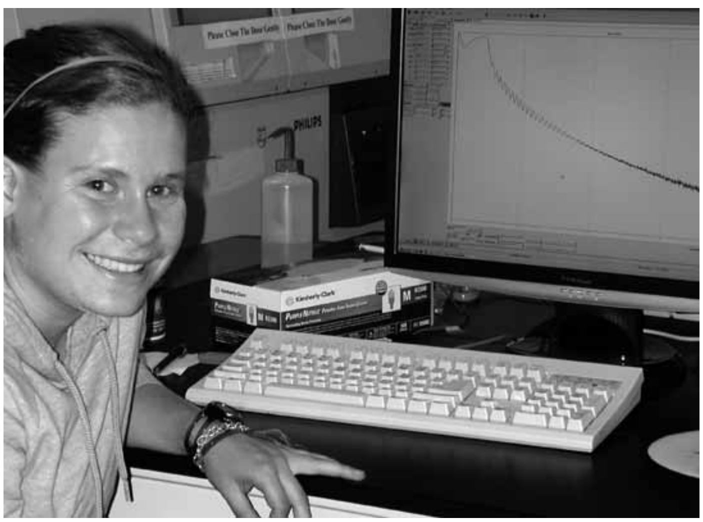
Undergraduate Research

Sara Tepfer is in her sophomore year as an undergraduate researcher in the lab of David Johnson. Tepfer graduated from South Eugene High School, and chose materials chemistry because she wanted something "totally different." "The solid-state lab is totally different than a gen-chem lab," she says. Tepfer spends much of her time in the X-Ray Diffraction Lab at CAMCOR, typically working with lead selenide and molybdenum diselenide; together they have potentially interesting thermoelectrical properties. "What we're shooting for are materials with high electrical conductivities but low thermal conductivities," she says. In 2007, the Johnson lab discovered a new, turbostratically disordered form of tungsten diselenide with the lowest thermal conductivity ever reported for a dense solid.

Tepfer deposits layers of atoms that are precursors similar to what the target material is, then those layers are annealed and they self-assemble into the target material. She uses an x-ray diffractometer optimized for thin films to look at structure, "then I go across the hall and another machine (electron microprobe) will tell me composition and the x-ray photoelectron spectrometer can do depth profiling to a 10 nanometer limit." The x-ray source shoots rays at the sample; how the rays scatter as they hit the sample reveals the density, roughness, and thickness of the films (determined from low-angle reflectivity scans). Higher-angle scans give the lattice parameter in the direction perpendicular to the substrate. "If you know the angle and the wavelength of your x-ray, then you can get the lattice parameter, which is the distance between the planes or layers of the compound," Tepfer explains.



Sara Tepfer in the X-Ray Diffraction Lab

Though the instruments aren't performing anything flashy, they are almost constantly busy. Step size and seconds per step vary a little, depending on the number of points per peak you want. Tepfer's work averages about 0.01 degrees per step, requiring about one second per step, "so to us it doesn't seem like it's doing anything," says Tepfer, who uses a Bruker D8 Discover X-Ray Diffractometer and four other machines optimized for powder samples and single crystals. Though they typically don't do this type of scan, on this day, Tepfer is heating a sample to measure the coefficients of thermal expansion, or how the total thickness of the sample changes with temperature. "I really enjoy every day here. It's taught me how to ask questions. It's amazing, we're so lucky here," Tepfer says. "Incredible instruments are just feet away from each other."

Graduate students have similar feelings about the opportunities presented by the facility. Ryan Atkins moved to the UO from Central Washington University and is in his second year of his Ph.D. program. Atkins received his master's in semiconductors through the Materials Science Institute. He looked at a few colleges and compared what they had to offer. "Nowhere else I went had any facility like this," Atkins says. "It was pretty much an easy choice."

Industry Partners

Companies can rent space in the Lokey Lab on five-year leases for more collaborative efforts. The first occupant of the Partnership Labs is Voxtel Inc. (www.voxtel-inc.com), of Beaverton, Oregon. Since 1999, Voxtel has focused on detectors and sensor technology, including single-photon-counting avalanche photodiodes that were used on the Hubble telescope, and on state-of-the-art short-wavelength infrared or near infrared detectors for high-end luxury automobiles.

The Voxtel lab is located next to a lab rented by Sony Corporation, their first lab located in the U.S. "Sony is working on primarily pure research," John Donovan says. "They're working on anything from battery technology and energy storage to smart materials."

Thomas Allen is a 2006 bachelor of science graduate of the UO's chemistry department, working with David Johnson and Mark Lonergan, a UO professor in physical and materials chemistry and director of the Materials Science Institute. He interned with Voxtel three years ago while completing the Materials Science Institute polymer science master's program. Now, he is one of Voxtel's five full-time employees at the UO location, and in September 2009, Allen was honored with the MSI Alumni Achievement Award. A handful of years ago, Voxtel's owner, George Williams, began collaborating with Mark Lonergan. As a senior, Allen was approached to do a research project with them working on thermoelectric materials. "Now I can make fifteen to twenty different types of nanocrystals, and for each of those classes there's different variations of each we can make," he says. Voxtel uses the crystals in a variety of applications, for instance in detectors. "As we make the crystals smaller, we increase the band gap and we can sort of engineer that band gap based on what size I engineer the crystals at in synthesis," he explains. "So we'll take different-sized nanocrystals that absorb at different areas of the spec-

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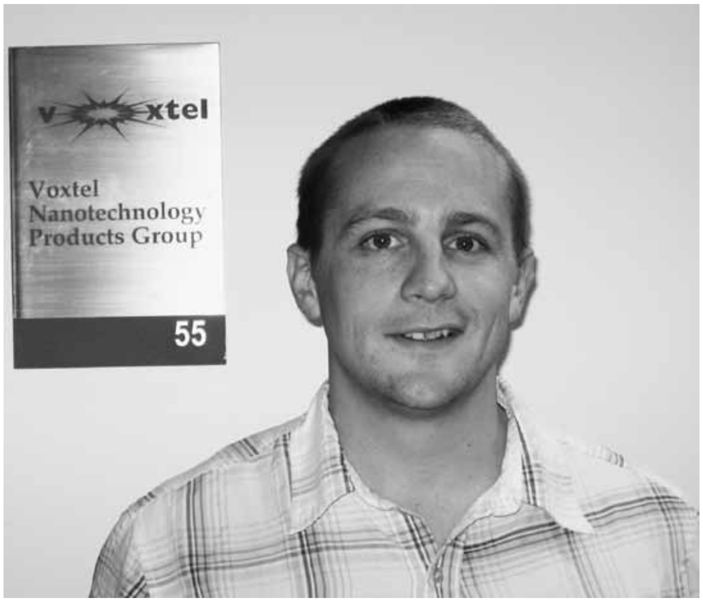
trum and we can make real interesting detectors out of them. What we're hoping to do is take nanocrystals, heat them up, and instead of having layers we'd have interfaces where the Janus particle should stabilize the molecule long enough to extract the exciton into the circuit.

"The big thrust of my research right now is to do experiments probing the interfaces of the Janus particle and what the effects



Voxtel employee Thomas Allen

crystals are kind of growing and melting together."

Allen is currently working to perfect what's called a Janus particle: a microscopic, "two-faced" spherical molecule whose halves are chemically different, such as an electron-withdrawing group on one side and an electron-donating group on the other. The molecule is excited by light to promote an electron, called an exciton. (If an electron is excited into a higher state it leaves a "hole," or positively charged atom, in its old state; an exciton is a bound state between the electron and its hole that provides a means to transport energy without transporting net charge.) Surrounded by an electrolyte or some sort of conducting polymer, the dipole created in the are on the photocurrent and the stability of the nanoparticle within this," Allen says.

The Lokey instrumentation is available to academics and industry partners alike. "With the Lokey Lab we have pretty much every piece of equipment that we would ever need to characterize nanoparticles. It's a really good partnership and collaboration," Allen says. "We wouldn't be able to do what we're doing if we didn't have this new paradigm shift in the way things are operating." Allen recognizes that the situation might be a bit uncomfortable for academics who aren't used to working so closely with government-funded industry. "We compete with these huge conglomerate corporations that no one's been competing with for years," Allen says. "It took us a couple years to get data and put them into the grants, and now people are actually recognizing that we're doing cool stuff. There's a huge difference between us and these other companies, and you can really see it and feel it. I feel that we are leaning toward something good. I think the partnerships here are really pushing not only the industry side of it at a different level but the academic side is getting thrusted differently too," he says. "I feel like I got an opportunity to keep pushing myself and expand what I'm doing."

The collaborative nature of the lab is readily apparent to Allen. "In one day I can make a nanoparticle and I can fully characterize it electrically, spectroscopically, optically, in just a matter of hours. I see chemists, physicist, material scientists talking with each other more and more. Now we're getting multidisciplinary approaches all coming together and I think that's making a huge difference."

Lokey Lab in the Future

The phase two addition of the Lokey facility will enlarge the animal research facility in Streisinger Hall, add a functional MRI, labs, and offices. Groundbreaking is planned for mid-2010. "In Oregon, high-tech is actually a better bottom line than agriculture and we support agriculture with something like $200 million a year at OSU," Donovan says. "We spend a fraction of that on high-tech support, so it makes sense to have something like this."

Oregon SuNRISE, a Collaborative Photovoltaics Laboratory

A $1.34 million investment at the University of Oregon and at Oregon State University by the Oregon Built Environment and Sustainable Technologies Center (Oregon BEST, oregonbest.org) expanded the Oregon BEST network of shared laboratories and equipment that serve researchers across the Oregon University System. The UO will receive $768,000 from Oregon BEST to establish the Photovoltaics Laboratory of the Oregon Support Network for Research and Innovation in Solar Energy (Oregon SuNRISE). The planned facility will offer Oregon's solar energy industry access to advanced research tools, faculty expertise, and a workforce trained in solar energy research and manufacturing.

John Donovan says this planned photovoltaic facility "will push the envelope on solar research." The UO's Mark Lonergan is director of SuNRISE. Lonergan has described its goals as fourfold: "We provide vital infrastructure for photovoltaics research and development, serve as a nexus for research collaboration, stimulate commercialization of state-of-the-art photovoltaics, and enhance the education of future scientists and engineers who will work in the PV field." Donovan says, "Oregon may not have a lot of sunlight, but we will have one of the country's best photovoltaic characterization facilities." —*Vanessa Salvia*

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Students and families enjoying the Septemberfest 2009 picnic.

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