Chemical Engineering

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Catalyst

UNIVERSITY OF WASHINGTON
COLLEGE of ENGINEERING
A Community of Innovators

In this issue

Memo from 'Management' to seniors: expect the unexpected

Senior Kyle Flotlin (left) connects tubing to the top of a Karr Column in the basement of Benson Hall as part of his Chemical Engineering 437 lab class. Assistant Professor Danilo Pozzo (right) recently helped redesign the class to better prepare students for challenging jobs in industry.

Seniors in Chemical Engineering 437 last winter didn't know what to expect when fictitious "Seattle Labs" hired them to extract proteins from egg whites using the 30-year-old Karr Column in the basement of Benson Hall.

A mysterious entity known as "Management" asked the students to isolate lysozyme, an enzyme that attacks bacteria and has applications in the pharmaceutical and food industries. Companies use the versatile protein to strengthen or preserve products such as throat lozenges, eye drops, baby formula and gourmet cheese.

Rather than follow a scripted routine using trustworthy data

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Baneyx wins grant from Gates Foundation to research vaccines

Innovative thinkers tried a new approach called vaccination more than 200 years ago, eradicating smallpox, preventing countless deaths and improving global health in immeasurable ways. However, infectious diseases such as HIV, malaria and tuberculosis still impact millions of lives, especially in the developing world.

François Baneyx, UW professor of chemical engineering and adjunct professor of bioengineering, hopes a new type of nanoparticle his research team will engineer as part of a project funded by the Bill & Melinda Gates Foundation may one day expand the list of diseases eradicated by vaccines.

Baneyx is one of five UW researchers to win a $100,000 grant from the Gates Foundation in the first round of the Grand Challenges Explorations program, which helps scientists around the world explore bold, new solutions for health challenges in developing countries. The Foundation announced the first 104 winners on Oct. 22, among them scientists from 22 countries and five continents.

"Chemical engineering is generally not considered as a traditional health discipline, yet chemical engineers have made enormous contributions to a number of health-related fields." ~ François Baneyx

"We are grateful to the Foundation for their willingness to take a bet on high-risk, innovative proposals that depart from classical ideas," Baneyx said. "Although we have many effective vaccines today, there is still a dire need for more."

To receive funding, Baneyx showed in a two-page application how his idea falls outside current

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Eric M. Stuve

Message from the Chair

Welcome to the latest issue of Catalyst. The year was a busy one for us (as they always are!). This issue features the latest developments in our curriculum reform and educational and research enterprises.

"A fixed series of studies required, as in a college, for graduation, qualification in a major field of study, etc." is the definition of *curriculum* given by Webster's Dictionary. A curriculum is not strictly fixed, however. It evolves over a period of time: a course here, change of credits there. Regardless, it takes a lot of work to establish a curriculum, and one does not undertake to reform one lightly.

We believe the time is right to make that change and have embarked on a project that reforms the chemical engineering curriculum by emphasizing molecular and nanoscale phenomena. The main element is to group the three transport phenomena courses with the reactor design course and then bring all four together with a multiscale modeling effort that enables students to start with molecular properties and calculate macroscopic behavior.

One part of the new curriculum is the revised Karr extraction column *(see the page 1 story)* that many of you might remember from the Unit Operations lab. That column was used for liquid/liquid extraction of an aqueous/oil system. Dr. Marvi Matos has refurbished the column to do aqueous bi-phasic extraction. That's extraction between two immiscible, aqueous phases. How does it work? One phase is a polymer solution and the other an ionic solution. Understanding the difference between the two phases requires an understanding of the molecular properties of the solutes.

We believe the time is right to embark on a project to reform the chemical engineering curriculum by emphasizing molecular and nanoscale phenomena.

In research news, Professor François Baneyx was awarded a grant from the Gates Foundation to explore the use of nanoparticles in vaccines. Assistant Professor Danilo Pozzo installed a Small Angle X-ray Scattering (SAXS) system in Benson Hall. SAXS provides information on liquid structure at the molecular and nanoscale level and is being used by undergraduates in the Surface and Colloids Laboratory course.

In energy-related news, Professor Dan Schwartz co-directs the project Bio-resource Based Energy for Sustainable Societies, an interdisciplinary team involving students from the College of Engineering and the College of Forest Resources. A unique feature of the project is its involvement with the Yakama Nation, which is trying to develop sustainable energy solutions using a holistic approach.

Our alumni spotlight features Dorothy Bowers, the department's 2009 R.W. Moulton Distinguished Alumna. Bowers was a key player in the world of environmental management standards in the later part of the 20th century and an inspiration to both men and women entering the chemical engineering field. Also featured is Jeff Nelson, a former student of Schwartz who is developing electrochemical printing technology.

Faculty highlights include Professor Dave Castner's election as president of the American Vacuum Society (AVS), Professor Buddy Ratner's selection by the AIChE as one of the 100 most influential chemical engineers of the modern era along with Professor Emeritus Les Babb, and Professor Shaoyi Jiang's publication of articles in *Nature* and *Science*, two of the most prestigious journals in all of science.

In the fall, we will welcome our newest faculty member, Dr. Jim Pfaendtner, who received his PhD from Northwestern University. Pfaendtner's research area is computational studies of molecular dynamics and multiscale modeling. His addition is a key factor in including multiscale modeling in the new curriculum.

Babb, Ratner make list of 'Top Hundred Chemical Engineers of the Modern Era'

Albert "Les" Babb and Buddy Ratner were named among the "One Hundred Chemical Engineers of the Modern Era" by the American Institute of Chemical Engineers (AIChE) in October 2008 as part of AIChE's centennial celebration.

The 100 chemical engineers of the modern era became leaders in the field after World War II and "guided the profession into the new century," according to the AIChE's Chemical Engineering Progress publication.

Babb was recognized in the "Achievements" category for developing a portable, fail-safe, single-patient dialysis machine and his research on the medical applications of nuclear energy.

Les Babb (left) and Buddy Ratner (right)

"This is an honor richly deserved by Les," said Eric Stuve, chair of the department. "His portable machine freed patients from treatment by large, hospital-based machines, ending an era in which those treated were selected by lottery, while the rest were destined to die."

Babb was known as a superb educator and co-founded the UW's Department of Nuclear Engineering.

Ratner was selected in the "New Frontiers" category for work in engineered biomaterial surfaces.

"We are very lucky to have Buddy Ratner at the UW, said Matt O'Donnell, dean of the UW College of Engineering. "National groups are now recognizing what we've known for a long time — Buddy is simply one of the best engineers in the world."

Stuve said Ratner selflessly supports his students and other colleagues."He has been a phenomenal researcher and mentor," Stuve said.

Jim Pfaendtner joins department, brings interest in biomolecular engineering

Jim Pfaendtner will join the department as an assistant professor in fall quarter 2009, bringing an interest in biomolecular engineering and the modeling of biological systems.

"We are delighted to have Jim join our faculty," said Eric Stuve, department chair. "His computational work in biomolecular engineering fills a long-standing need in our department. Jim will be a dynamic teacher and our students will appreciate his instruction."

Pfaendtner's research will address issues such as production of biofuels, development of novel biomaterials, and investigation of a new class of peptides as potential drug compounds.

"I expect that my diverse research plans will inherently promote collaboration with many members of the department's faculty," Pfaendtner said.

Pfaendtner is currently a postdoctoral research fellow in the National Science Foundation's (NSF) International Research Fellows Program (IRFP) working under the supervision of Michele Parrinello, a professor at ETH Zürich, and Gregory A. Voth, a professor at the University of Utah. His recent work involves using computer simulation to study large proteins and protein complexes, and developing methods for systematic multiscale modeling of biological systems.

Jim Pfaendtner

Pfaendtner earned a doctorate in chemical engineering in 2007 at Northwestern University (NU), where he participated in an NSF IGERT program on Virtual Tribology. He did his thesis research on the modeling of complex reacting systems and development of algorithms to rapidly and accurately estimate chemical reactivity using quantum mechanics.

Pfaendtner participated in NU's Teaching Apprentice Program and was voted Teaching Assistant of the Year in 2005. He earned his bachelor's degree in chemical engineering in 2001 from the Georgia Institute of Technology.

Q&A with new faculty member Jim Pfaendtner

What drew you to the UW's Department of Chemical Engineering?
The UW's College of Engineering is very strong, and the Department of Chemical Engineering is doing world-class research. There are several faculty already doing research on alternative energy and the department is also linked with the UW's NSF IGERT program on bioresource-based energy, which is a major focus of my future research.

How does your research focus align with the department's diverse expertise?
The department already has a strong focus in biomolecular engineering and energy research, and I believe my own work will bring a new dimension to these areas through investigations based on molecular simulation and modeling. Furthermore, my work has the potential to make an impact on the research of faculty who are working in the areas of materials and catalysis as the modeling techniques we employ are generally applicable.

What are you most looking forward to about moving to the Seattle area?
I love the outdoors and have always enjoyed camping, hiking and snowshoeing. I'm very much looking forward to spending time in the mountains getting to know the area better. I'm also a huge fan of coffee - I thought it would be tough to leave Switzerland (near Italy) and the great espresso, but I'm pretty sure Seattle will be able to fill the void.

What do you like most about teaching?
My favorite part about teaching is when I can facilitate in-class discussions or activities that help students teach themselves (and each other) difficult concepts. I think students learn the most when they are actively involved in class on a day-to-day basis, and I plan to employ a variety of teaching forms to make that happen.

What research projects do you anticipate beginning first?
My biggest interest right now is to combine the work I did in graduate school on kinetics and reaction engineering with the work I have done in my postdoctoral research on biophysics to study chemical reactions that happen in enzymes inside of the cell. There are a lot of significant challenges before we can produce transportation fuels and energy from biological systems, and I believe that my research will help to address these.

UNCERTAINTY

(continued from page 1)

gathered beforehand by their instructors, students were given a single goal and no clear set of instructions.

If the project sounds especially challenging to undergraduates with no experience in industry, not to worry. Danilo Pozzo, an assistant professor, and Marvi Matos, a lecturer who joined the department in 2008, planned it that way.

The pair of innovators recently redesigned the "Chemical Engineering Laboratory II" module to better prepare seniors for the uncertainty that awaits them in their first projects outside the UW.

Chemical engineers in the 20th century turned petroleum into fuels and plastics, designed artificial organs, improved antibiotics, invented countless household products and laid the foundation for many modern industrial processes. In the 21st century, chemical engineers will play a key role in the development of nanoscience, biotechnology and other rapidly evolving fields.

The pace of this evolution places a burden on educators like Pozzo and Matos, who must train students to deal with increasingly complex challenges.

"In traditional modules, the students are given a clear set of objectives and reference materials to accomplish their task in a short period of time," Matos said. "In this experiment the students are presented with a variety of options for material compositions, limited availability of resources, and no clear short-term goals. The module is truly open-ended."

In order to complete the project, the students broke into teams and separated the process into three distinct phases, each phase taking three weeks to complete. Each team gathered data and produced reports that future teams would need to complete the project on time.

"Students were not given a very well-defined problem. In fact, they were just given a big picture goal, to isolate the proteins, that didn't give them time to meet on their own," Pozzo said. "They had to identify smaller, achievable problems to solve before the class as a whole could meet the big picture goal."

The first teams explored and documented the optimal conditions that future teams would need to isolate lysozyme using the Karr Column. "Management" provided a few articles to jumpstart their research, but Pozzo and Matos tried to stay hands-off.

"The instructors served as consultants," Matos said. "Students were encouraged to find their own voice and not to follow our suggestions if they believed they had a better solution. We were there to offer guidance and the materials they needed, and to evaluate their performance as individuals and teams."

"In this experiment the students are presented with a variety of options for material compositions, limited availability of resources, and no clear short-term goals. The module is truly open-ended."

~ Marvi Matos

The second teams used the suggestions from the first teams to evaluate possible configurations of the Karr Column to produce an aqueous bi-phasic system. This system was a necessary condition for the third teams to successfully extract the lysozyme from the egg whites.

Finally, the third teams were tasked with using the data gathered by the first two teams to isolate lysozyme under a deadline using limited materials.

Relying on other teams to provide accurate data reminded senior Sarah Widder that what goes around, comes around. "Thinking about how we used the data we got from other teams definitely made me think about the information we gave to the next lab group," Widder said. "I thought about what we would like to have known when starting the lab and tried to convey that information as clearly as possible for others."

Carina "CJ" Mitchell, a senior in the class, said it "was difficult to know whose work to trust, especially because every team's results were presented differently."

Mitchell said the biggest challenge was learning how to interact effectively with different personalities.

"Getting people on the same page can be challenging when everyone has a different approach and level of understanding, and particularly so when we are all quite busy with other difficult classes," Mitchell said. "It's also harder to pressure a teammate to contribute more when you don't know how they'll react."

Senior Kyle Flotlin thinks the collaborative approach works best. "Too often, groups will split up tasks so that one person has the planning report, one person does the analysis, and one person writes the final report," Flotlin said. "This is not the way to do things. You're a team for a reason, and each member should put forth effort on every task. Working together in a group gets tasks done faster and at a higher quality."

Matos, who noted that the Karr Column may be older than both her and Pozzo, said that future versions of the class may include using the same approach to model the extraction of radioactive materials in the remediation of nuclear wastes from the Hanford site in eastern Washington.

"The extraction process can fundamentally be designed the same way as for the isolation of lysozyme from egg white," she said. 'We would use materials that were similar to nuclear wastes, but obviously not the radioactive stuff."

No matter how the class evolves in the coming years, Matos said she and Pozzo aim to "help students develop a set of 'soft' skills, such as leadership, composure under uncertainty, critical thinking, creativity, teamwork, time management and thinking ahead."

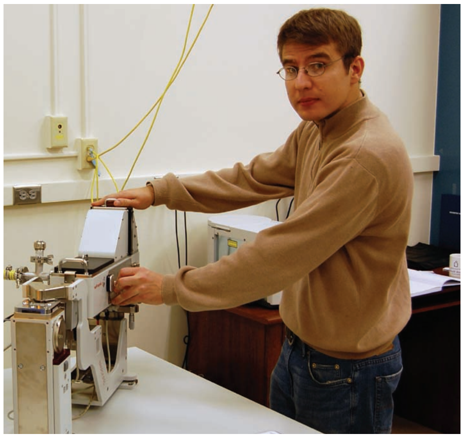
New SAXS device opens door to nanoscience research and instruction

The department acquired a Small Angle X-Ray Scattering (SAXS) device in early February that will help professors and students explore materials at the nanoscale level. The new device is the only one of its kind at the UW.

"The instrument is extremely versatile in its applications," said Danilo Pozzo, assistant professor. "It essentially provides bulk structural information on length scales between .1 and 100 nanometers. It will provide information such as particle size and shape, surface area, dispersion state, electron density profiles and more."

John Berg, Rehnberg Professor of Chemical Engineering, called the new SAXS machine "a tremendous addition to the arsenal of instrumentation we have for probing the properties and behavior of colloidal media."

Pozzo said his research group will use the device to "characterize the interfacial structure of emulsions, the structure of bio-polymer networks and the complexation of surfactants with proteins among many other things."



Danilo Pozzo sets up the department's new SAXS device for nanoscience research.

Berg said his group is "excited about its potential for the design of new nanoparticle-reinforced resins for composite materials of the type used in the new Boeing aircraft, as well as fundamental studies of aggregation phenomena in complex media."

The SAXS machine also will be used for instruction, starting with ChemE 455 lab class on surfaces and colloids. "The first module will correlate the rheology and other macroscopic properties of materials such as co-polymers with their internal structure," Pozzo said. "A device like this allows students to probe the structure of a block copolymer as it goes from a disordered phase into a highly organized cubic crystaline phase."

While the device can be used for cutting-edge research on nanoscience, Pozzo said it is not especially difficult to use. "The interpretation of the data can be challenging," Pozzo said. He also said that students would be trained to safely operate the device, since it generates X-rays.

Pozzo hopes the department's new SAXS machine will enable collaboration with industry. "I think that several local industries will be interested in this instrument," Pozzo said. "In particular, companies like Boeing might want to analyze the structure of new coatings, polymers or composites that they develop or use. Companies like Amgen may want to obtain structural information on proteins or other biomolecules."

VACCINES *(continued from page 1)*

scientific paradigms and could lead to significant advances in global health.

Baneyx's winning project is titled "VACAS: Vaccinating Adjuvant Core Antigen Shell Nanoparticles." His research team aims to develop a simple, inexpensive way to engineer nanoparticles that boost the body's immune system by targeting dendritic cells in lymph nodes. These cells play a key role in initiating immune responses to infectious diseases.

"Dendritic cells are like tiny U.N. peacekeepers," Baneyx said. "They constantly check their surroundings for bad guys, like viruses and pathogenic bacteria. When they find them, they either ingest them or nibble out a piece of the offender and present pieces of the bad guys on their surface."

Presenting these antigens to the body's immune system, Baneyx said, "brings out the immune system's cavalry, which helps fight off the infection."

However, since the body contains very few dendritic cells, their targets often escape unscathed. "The VACAS are designed to make a bee line for dendritic cells and prime them for efficient recognition of the bad guys," Baneyx said.

Additional funding of $1 million or more will be available for projects that show promise. "The first phase is proof of concept," Baneyx said. "Can we actually make what we propose, can we do it cheaply and will it be better--or at least as good--as traditional approaches?"

If Baneyx's team is successful, he'd like to design technology that would make it possible to fabricate the new vaccines in developing countries.

Baneyx is the director for the UW's Center for Nanotechnology and co-director of the Genetically Engineered Materials Science and Engineering Center (GEMSEC). He is a leader in the developing field of molecular biomimetics, which draws inspiration from nature to build technologically relevant molecules, devices and systems.

When selecting winners for the grants, the Gates Foundation considered topics that engaged participants outside traditional global health disciplines. "Chemical engineering is generally not considered as a traditional health discipline," Baneyx said, "yet chemical engineers have made enormous contributions to a number of health-related fields, from recombinant protein manufacturing to tissue engineering and biomaterials to biological sensing."

Eric Stuve, chair of the UW's Department of Chemical Engineering, said Baneyx's work is "a testimony to the contributions in global health care that chemical engineers can make."

Baneyx's research team will work in close collaboration with Dan Schwartz, UW professor of chemical engineering, and members of Schwartz' lab. He said that GEMSEC provided the initial impetus for the project "as a group of like-minded colleagues with an enabling infrastructure."

Ron Andermann (MS '74) graduated from John Marshall Law School in Chicago and was admitted to the Illinois Bar in 2003. Andermann is a practicing patent attorney.

James Henry Jenson (BS '37, MS '39) passed away on March 26 at age 94. Jenson was an officer in the U.S. Army from 1942 to 1946. He continued in the Army Reserve and retired as a Colonel in 1974. Later in his career he served as a chemical and metallurgical engineer/consultant. He wanted to be remembered as "a man who took care of his people, whose word was his bond, and who enjoyed a full life in a great industry." Jim was a loyal friend and frequent visitor to the department.

Jake Koerner (BS '04) was employed at Lawrence Livermore National Laboratory from 2004 to 2008. He plans to pursue an MBA at Columbia Business School.

Betty Benson Runstad (BS '36, Nutritional Sciences) passed away on Dec. 26, 2008 at age 95. Runstad was granddaughter of UW Regent Judge J.T. Ronald and daughter of Henry Kreitzer "HK" Benson, founder of the UW's Chemical Engineering program. She asked that remembrances be sent to the Runstad Family Endowed Fellowship, which supports several graduate students in the department each year.

Jan Sleicher, wife of former Department Chair Charles Sleicher, passed away on Nov. 4, 2008 from breast cancer that was first diagnosed and treated in 1999. She was 77. "Jan was loved by everyone she touched," wrote Charles Sleicher. "She was articulate, creative, generous, selflessly thoughtful of others, and the most genuinely kind person that most of us ever knew."

Dorothy Bowers wins 2009 Distinguished Alumna Award

"Success comes from being excited about what you do and having a passion for doing it," said Dorothy Bowers (BS '69), winner of the department's R.W. Moulton 2009 Distinguished Alumna Award.

Bowers turned her passion for science into a career developing standards to reduce the impact of chemical processes from industry on the environment.

Bowers grew up in a tiny New York town of 300 people, two taverns and a general store. "I don't remember ever thinking I would do anything but some kind of science," said Bowers. "But there were no scientists, no doctors, not really any professionals, so I had few chances to learn about opportunities in the sciences."

Bowers chose chemistry as a major at the University of Buffalo without "really knowing what it might lead to." After earning her bachelor's degree at 19 and working for a chemical company, she moved with her husband and two sons to Vancouver B.C. to work for a pulp and paper mill consulting company. "All the professionals were male and engineers," Bowers said. "Being 'only' a chemist, my job was to publish a quarterly journal on breaking technology and business issues."

Working in the pulp and paper industry in the 1960s exposed Bowers to a variety of emerging environmental issues. "I could clearly read the future in two areas," Bowers said. "Attention to the environment was about to explode, and I would never get any respect from engineers unless I had an engineering degree."

When Bowers' husband took a state job in Olympia, she decided on the UW because it had an excellent engineering school and was "only 50 miles each way."

Howard Gardner, a professor who taught pulp and paper technology, agreed to be Bowers' advisor. "He was not afraid of a challenge," she said. Since she'd already completed her non-engineering coursework, she was required to take only engineering classes and earned her second bachelor's degree in just four quarters.

"The likelihood is great that any science student in school now could end up in a career that does not even exist today." ~ Dorothy Bowers

Bowers would leave from the UW in time to pick up her two sons from grade school and the three would do homework together while her husband, a psychologist, made dinner. "Chemical engineering was much harder than I had anticipated," Bowers said. "Fortunately, my family was very supportive."

The week she graduated from the UW, Congress cancelled a B-1 bomber contract with Boeing and the company laid off more than 1,500 scientists and engineers. "All of the 'we'll get back to you in a week with a job offer' prospects suddenly had a glut of experienced talent," Bowers said. The family moved to New Jersey, where she got a job designing pollution control equipment for a large automobile paint company.

"After three years, I realized that solvent-based auto finishes would be eliminated in a few years, yet the company insisted on doing business as usual," Bowers said. "It was time to look for a more enlightened organization."

Bowers joined Merck & Co., then the world's largest pharmaceutical company, in 1974. As an engineer in the company's fledgling, two-person environmental department, she helped create one of the first strategic environmental plans in U.S. industry to reduce pollution from chemical processes. She worked for the company for 25 years and retired as vice president of a worldwide group of more than 200 that won several awards from the Environmental Protection Agency (EPA).

When Bowers retired from Merck & Co. around 2000, Christine Todd Whitman, the head of the EPA, asked her to chair the National Advisory Council on Environmental Policy and Technology. Between birdwatching adventures she still provides guidance in environmental management internationally.

Bowers encourages the current generation of students to keep an open mind about their career direction. "The path I ultimately pursued bears little resemblance to what I thought would be the path of my chemical engineering career," she said. "The likelihood is great that any science student in school now could end up in a career that does not even exist today."

Nelson and colleagues launch Ionographics electrochemical printing company

A group of three alumni hope the electrochemical printing technique they honed at the UW will help manufacturers find cheaper ways to test the microchips that drive computers, mobile phones and most modern electronic devices.

The Electrochemical Printing (EcP) technique, developed in Professor Dan Schwartz's Benson Hall laboratory with graduate student John Whitaker (PhD '03), would allow microchip manufacturers to sculpt smaller, more cost-effective versions of the microscopic probes used to test their products.

"EcP is somewhat like an ink jet printer that deposits metals and other functional materials, instead of ink," Schwartz said. "You can draw in software a metal pattern you want fabricated and hit 'Print' to build it. It is a flexible manufacturing method, so it is especially well-suited for low-volume, high-quality applications. The technique seems to have some unique traits for building testing boards for probing microchips ."

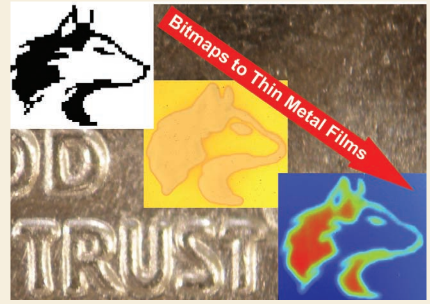
After winning the award for "Best Design/Prototype" in the UW's 2007 Business Plan Competition, Jeff Nelson (PhD '07), founded Ionographics in November 2007 to begin applying the electrochemical printing technique using a new tool called the EMIFAB 1000.

Dan Allred (PhD '06) joined the Ionographics team full- time in late 2008. John Whitaker (PhD '03) is a co-founder who serves on the company's advisory board while maintaining his full-time employment with Modumetal, Inc.

Ionographics secured an exclusive option license for EcP from the UW in January 2009 and will soon begin fabricating improved contactor probes for testing microchips from their new headquarters in the Ballard area of Seattle.

As computers, cell phones and other electronics become increasingly popular in the 21st century, Nelson sees the market for chip-testing probes as a huge growth field.

"The chip-package testing contactor industry has remained largely unchanged over the last 20 to 30 years," Nelson said. "A big problem in a production environment is excessive downtime on testing units related to contactor issues. "



"Electrochemical printing offers manufacturers increased flexibility and the unique ability to locally tailor both the shape and material properties of integrated circuit test card contacts." ~ Jeff Nelson

Current chip-testing units typically require enough force per contact that other components receive excessive wear during the testing process. This wear increases the cost of testing, since multiple parts must be repaired or replaced frequently.

"A technology that can reduce the size and force of testing contactors by ten times is poised to capture value in this market," Nelson said.

"EcP offers manufacturers increased flexibility and the unique ability to locally tailor both the shape and material properties of integrated circuit test card contacts," Nelson said. "Patterns can be sculpted in three dimensions by tuning the operating conditions across the substrate."

Nelson said EcP is capable of patterning metals, alloys, polymers and even proteins on conductive substrates. The EMIFAB 1000 tool requires no special facilities, since EcP occurs at ambient conditions.

All design is done using software, so no last-minute hardware adjustments are needed and Ionographics can modify designs for customers quickly and fluidly.

In addition to the solid foundation in transport properties, fluid mechanics, thermodynamics and electrochemical engineering Nelson and his teammates gained as doctoral students in Benson Hall, he said the communication skills Schwartz instills in his protégés has been instrumental to their success.

"Knowing how to communicate effectively has been a tremendous asset as I've started to network with investors and entrepreneurs," Nelson said.

Nelson, who was a student in the UW's Center for Innovation and Entrepreneurship (CIE) also thanked the UW's TechTransfer's LaunchPad program for helping to catalyze Ionographics as a new business. LaunchPad is a three-year-old initiative formed specifically to identify and help along startup opportunities from technology developed at the UW.

Ionographics received a Phase I Small Business Innovation Research (SBIR) award of $100,000 from the National Science Foundation in July 2008.

In December 2008, a PTS company that wishes to remain nameless made an additional investment in Ionographics that enabled Nelson and colleagues to build their own EMIFAB 1000 tool.

Nelson recently submitted a Phase II SBIR proposal to the NSF for $500,000 in funding over 24 months and will hear back later this spring. Check the department Web site at http://cheme.washington.edu in the summer for an update.

Do you have news to share with fellow alumni? Please send details to dept@cheme.washington.edu

News briefs

Professor **Shaoyi Jiang** co-authored an article entitled "Catch, Kill, and Release" that was highlighted in the Oct. 31, 2008 issue of *Science* and the November 2008 issue of *Natural Materials*. Jiang and other UW researchers engineer coatings that combine antimicrobial and nonfouling properties. These coating may have a range of applications in implantable medical devices and more. Jiang also received the Boeing-Roundhill Endowed Professorship in Chemical Engineering in October 2008.

Professor Emeritus **Bruce Finlayson** was elected vice chair of the Chemical Engineering Section of the National Academy of Engineering (NAE). Finlayson will serve as chair in 2010.

Anya Yermakova, one of three undergraduate Amgen Scholars who worked on research projects last summer in Benson Hall at the UW, was named a Rhodes Scholar. Yermakova, a senior majoring in biochemistry at Northwestern University, worked in UW Assistant Professor Danilo Pozzo's lab.

Professor **Dave Castner** was elected president of the American Vacuum Society (AVS) in fall 2008. Castner will serve a three-year term. He will serve as president-elect in 2009, president in 2010 and immediate past-president in 2011. "I am honored to be elected president of AVS for 2010," Castner said. "As president, one of my top priorities will be to ensure the annual AVS International Symposium is of the highest quality and vitality, delivering value to all members in academia, industry and national laboratories." Castner directs the the National ESCA and Surface Analysis Center for Biomedical Problems (NESAC/BIO).

Schwartz and IGERT students begin work with Yakama Nation on bioenergy project

Sara York (left), Kurt Spies (center) and Valerie Lieu (right)

Professor Dan Schwartz and seven UW doctoral students started working with the Yakama Nation and Grant County Public Utility District in January to perform an assessment of a biomass-fueled heat and power facility planned for the reservation. Chemical engineering doctoral students Sara York, Kurt Spies, and Valerie Lieu are all participating in the $3 million IGERT bioenergy project.

"Renewable energy has emerged as a national priority, but it is essential that alternative energy does not simply introduce a new set of environmental, economic, and societal challenges as a substitute for those associated with fossil energy," Schwartz said. "The holistic assessment approach our students are using on the bioenergy project with the Yakama people is a model for alternative energy development nationwide. The UW is establishing itself as a leader in this area."

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