



Two CBE alums receive top college honor

On Oct. 16, 2015, during a daylong celebration of engineers, Laura Leonard (BS '01) of Honeywell UOP and Bahram (Barry) Siadat (BS '75), co-founder of SK Partners, were among 12 influential engineering alumni to earn accolades from the College of Engineering for their outstanding professional accomplishments.

LAURA LEONARD ▶

While earning her UW-Madison bachelor's degree in chemical engineering, Laura Leonard discovered a passion for problem solving that has served her well as an inventor and leader in the petrochemical industry. Laura recalls that one pivotal moment came during summer lab, a final course in which all chemical engineering seniors must apply everything they have learned in a series of challenging experiments.

"Professor Thatcher Root must have noticed the spark in my eye as I puzzled over a particular experiment when he told me he thought I would enjoy research, and in doing so, shaped the decisions I would make as a

(Continued on page 3)



Laura Leonard with Dean Ian Robertson (left) and CBE chair, Manos Mavrikakis



Dean Ian Robertson, Barry Siadat and Manos Mavrikakis

◀ BARRY SIADAT

Throughout a formidable record of accomplishment on both the technical and business sides of the chemicals and materials industries, Barry Siadat has never forgotten the value of thinking like a chemical engineer. Barry earned his UW-Madison bachelor's degree in chemical engineering in 1975, and he credits Professors Stuart Cooper and Jim Koutsky with helping him develop a keen interest in materials and polymers, and Charlie Hill with teaching him the fundamentals of chemical engineering.

(Continued on page 3)

CHAIR'S MESSAGE



Manos Mavrikakis

As the newly elected department chair, I am delighted to share this issue of *On These Foundations* with you. In the pages of this publication, you'll realize that members of this

department—those here on campus and those of you around the country and around the world—continue to make terrific contributions to the profession and to society. UW-Madison is redefining what it means to be a public university and we, as leaders within the university and the discipline, are at the forefront of this change. With strong support from our alumni and the Wisconsin Alumni Research Foundation, the technology transfer organization serving UW-Madison, our department is moving forward stronger than ever.

First, I would like to thank **Tom Kuech** for his productive leadership of the department for the last three years. This past year, a matching gift opportunity from alumni John and Tashia Morgridge raised nearly \$250 million for endowed professorships and chairs at UW-Madison, including five in this department, in addition to a distinguished chair established in the department by WARF in honor of **Ernie Micek** (BS '59), which we highlighted in the last issue of this newsletter.

Also in the last issue we highlighted the generosity of **Jay and Cindy Ihlenfeld** (PhD '78 and BS-Business '75, respectively) in establishing a new professorship in the College of Engineering. On pages 4 and 5 of this issue, you can learn about the generous contributors to the remaining four new professorships in the department: Endowed professorships provide much-needed flexible funding that helps to attract and retain top faculty and student talent, while encouraging the creative risk-taking that leads to innovation in research and teaching.

This semester, we welcomed **Victor Zavala** as the Richard H. Soit Assistant Professor (note another newly endowed professorship!). Victor joins us from Argonne National Labs and is an alumnus of **Larry Biegler's** (PhD '81) group at Carnegie Mellon. You can read



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more about Victor on page 11. His research interests in formulation of mathematical optimization models for control, estimation, and systems design will complement and enhance our existing strengths in these areas. Incidentally, on page 10, you can read about Victor's PhD advisor's latest achievement: the AIChE William H. Walker Award for Contributions to Chemical Engineering Literature.

Larry Biegler wasn't the only member of the UW CBE community to receive top honors at this fall's AIChE annual meeting. **Harold Kung** (BS '71), of Northwestern University, won the R.H. Wilhelm Award in Chemical Reaction Engineering (page 10), and **Jim Dumesic**, the newly elected Vilas Research Professor at UW, won the Alpha Chi Sigma Award for Chemical Engineering Research (see page 8). Three national awards from AIChE in one year speaks volumes about the tradition of excellence in chemical engineering at UW-Madison.

Once a year, we are able to provide our own recognition of the professional accomplishments of a departmental graduate through the college's Distinguished Achievement Award. On the front page, you can read about this year's awardee, **Barry Siadat** (BS '75), whose technical, operational and investment expertise has helped promote the development of the specialty chemicals and the materials industries and you can read about **Laura Leonard** (BS '01) who received the college's Early Career Achievement Award for her leadership in applying fundamental engineering principles to advance the efficiency and commercialization of key industrial processes.

On page 10, you can read about the even-earlier-career achievements of alumni like **Ethan Lippmann** (PhD '12), **David Murray** (BS '09) and **Lars Grabow** (PhD '08).

Thanks for everything you do and have done to enhance the reputation of the UW CBE community. I could not be more grateful for the opportunity to lead this great department.

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Please send your news to che@che.wisc.edu. We hope to share more alumni news in future issues of this publication.

Alumnus **David Bluemke** (BS '80) has garnered accolades as the most influential radiology researcher in the nation. Bluemke, director of the Radiology and Imaging Sciences division at the U.S. National Institutes of Health (NIH), was recognized in October by AuntMinnie.com, an international website for radiologists and other medical imaging professionals.



David earned a doctorate in biophysics and his MD at the University of Chicago after graduating from UW-Madison. He spent 25 years at Johns Hopkins University before joining the NIH in 2009. AuntMinnie.com recognized David for his contributions to the radiology field, and in particular for his research on cardiovascular disease at Johns Hopkins and the NIH. His involvement in a study that tracks risk factors for cardiovascular disease across ethnicities has been particularly productive, with results reported in the Nov. 10, 2015 issue of *JAMA*. "[The study] has greatly contributed to a better understanding of the relationship between cardiovascular disease, risk factors, and the structure of the heart," AuntMinnie.com noted.

CBE alums honored *(Continued from front page)*



LAURA LEONARD

young professional,” Laura says. “I have often thought back to that conversation, as the moment I decided to start my career doing pilot-plant-scale research in an industry where chemical reactions played a significant role.”

After graduating in 2001, Laura put that interest to work as a development engineer at UOP LLC, a Honeywell-owned company that develops technology for the refining industry. She

has risen through several engineering and management roles at UOP, and since 2014, has served as senior product line manager for reforming and isomerization technologies. Her contributions to UOP include working on its Oleflex and SelectFining processes, which have helped refineries operate more efficiently in the face of chemical and resource challenges.

In addition to authoring numerous scientific articles and presentations, Laura has served as inventor or co-inventor on more than 25 U.S. patents.

“These patents are evidence of my contributions across many of UOP’s product lines, collaboration with my colleagues, and my innovative engineering solutions to commercially relevant issues,” she says.

Laura is a member of the American Institute of Chemical Engineers, having served on its Fuels and Petrochemicals Division executive committee and programming committee since 2008, and was a member of the Tau Beta Pi Honor Society at UW-Madison. Her professional honors include the 2014 AIChE Industrial Progress Award, the 2012 Indian Chemical Engineer Best Paper Award, the 2012 Honeywell Team Performance Award and the 2007 UOP R&D Role Model Individual Award.

Laura lives in Western Springs, Illinois. She and her husband, Ken, enjoy spending time with their three young children, Aiden, Eli and Judah, and take pride in helping them develop a love of science and engineering.



BARRY SIADAT

“Over the years I have successfully applied the systems approach taught by chemical engineering to just about any situation where one needs to carefully evaluate factors that are important to the outcome and approach them in such a way as to ensure the desired outcome,” Barry says.

That certainly held true as he went on to earn his PhD in chemical engineering from the University of Massachusetts-Amherst

and work as a scientist at W.R. Grace & Company, authoring more than 25 scientific journal articles and earning numerous United States patents for his innovations in areas as diverse as polymer compositions, masonry and roofing materials. But it proved equally vital as Barry took on management roles at W.R. Grace & Company, and then at companies

including AlliedSignal and Avient Technologies. He eventually began combining that management experience with the investment side of the business as co-founder, president and managing director of SK Partners.

In his current role at SK Partners, Barry serves as chairman of several specialty materials and chemical companies in a \$9 billion portfolio with more than 9,000 employees. Establishing SK and building it up to its current strength, he says, “is perhaps the culmination of all my prior technical and business achievements.”

He also serves on the board of the Mt. Sinai Medical Center in his current hometown of Miami Beach, Florida. In 2014, he received the UMass-Amherst Distinguished Achievement Award.

Barry lives in Miami Beach with his wife, Afsaneh. He has three children—Sharareh, Seterah and Afshin—and enjoys spending time with his grandkids and working out.

Monfres' professorship gift comes out of 'tremendous need' they see to support UW

Alumni Bill and Karen Monfre have actively supported their alma mater for years. A recent gift matching opportunity has spurred the couple to take their support to the next level.

The Monfres, of Howard, Wisconsin, recently gave a gift to establish the **Karen and William Monfre Professorship** in the department. The gift was matched by UW-Madison alumni John and Tashia Morgridge, who announced a \$100 million gift matching opportunity in the fall of 2014. "That was a critical element," Bill says of the gift. "The generosity of John and Tashia made this opportunity possible."

Bill is a 1985 graduate of the chemical engineering program, and Karen is a 1986 graduate of the accounting and information systems program in the Wisconsin School of Business.

The Monfres decided to make their gift with no strings attached, so the CBE department would be able to use the professorship as it sees fit for the betterment of the department. "Our goals and aspirations are that this gift can be used to retain world-class faculty for years to come," Bill says. "We're engaged in this from the standpoint of long-term health and continued excellence in the department."

Bill was employed as an engineer and manufacturing manager for Procter & Gamble for 23 years before leaving the company in 2008. He then purchased two businesses—Quality Insulators Inc. and ARI: Asbestos Removal Inc.—that he owns and operates to this day.



Bill and Karen Monfre

"There is no doubt in my mind that my UW degree opened doors that were made available to me," he says.

Karen is a partner at Wipfli LLP, a top-25 CPA and consulting firm based in Milwaukee, and says she, too, has benefited tremendously from the education she received from UW-Madison.

The two are actively involved in the Wisconsin Alumni Association and its Brown County chapter, and Karen serves on the UW Foundation Board. "We were motivated to do this based on the generosity of John and Tashia, and we hope others are inspired to do something as well based on our efforts and those of others who have donated. No gift is too large or too small," says Karen.

With faculty support, inspiring future generations of students to think globally

Dick Antoine (BS '69) and Dorothy O'Brien (BS SOHE '70), who met while studying at UW-Madison, typically contribute to their alma mater as a couple. The recent historic \$100 million matching gift from John and Tasha Morgridge, however, moved Antoine and O'Brien each to establish named professorships—his, the **Richard L. Antoine Professorship**—in the department or school from which they graduated. "The Morgridge grant is an inspiration to all of us to do something special for the university and the professors who changed our lives," says Dick.

He hopes that, with his support, future generations of students will gain the critical thinking skills and global outlook he learned during his time here. "Growing up, I had never been more than 50 miles from the state of Wisconsin," he says. "Coming to UW-Madison changed my perspective on the world."

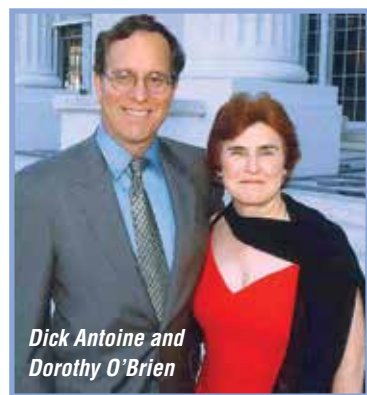
After graduation, he traveled extensively and lived abroad during his 39-year career working for the Procter & Gamble Company.

Dick believes chemical engineering teachers at UW-Madison provide students with more than simply a strong foundation in chemical engineering principles. "Those professors really taught me how to think systematically, they taught me the value of data, and they gave me the opportunity to think beyond Wisconsin," he says.

Specifically, Dick fondly recalls being inspired by his faculty advisor, Professor Roland Ragatz, and Professor Bob Bird, because of their amazing abilities to explain complex concepts in simple terms. He maintains contact with Bird to this day—they forged a common bond over each having spent time living and working in Japan.

In the future, he envisions UW-Madison growing as one of the nation's top-10 engineering programs. Presently, however, sustaining the quality of this higher education needs to be a top priority. "The concern is that the legislature and governor do not seem to be supportive of education and it will become increasingly hard to improve our status," he says.

Dick hopes that a partnership between philanthropy and public support will enable UW-Madison to continue teaching students the perspectives and skills that served him, and many others, so well over the decades.



Dick Antoine and Dorothy O'Brien

Don Baldovin, passionate about maintaining UW-Madison's sterling status as a leading teaching and research institution, has a long track record of supporting his alma mater, with two undergraduate scholarships and graduate fellowships bearing his and his parents' names. Now, thanks to a historic matching gift from UW-Madison alumni John and Tashia Morgridge, he continues his support by establishing the **Baldovin-DaPra Professorship** in chemical and biological engineering. "I would never have had the career I had if I didn't have the UW-Madison chemical engineering degree," says Don, who graduated with the class of 1957 to go on to a long and successful tenure at Standard Oil of Indiana, later renamed Amoco.



Don Baldovin: Honoring heritage with faculty support

During his storied time with Standard Oil, Don was one of a two-person team that successfully negotiated a \$600 million cash payment from the Iranian revolutionary government during 1988-90 to compensate for the expropriation of Amoco's commercial activities. He personally mentored 85 MBAs over the course of their careers. He also slick-talked his way onto an unregistered cargo jet to safely retrieve 40 Amoco employees stranded in Kabul after the outbreak of the 1971 Pakistan-India war.

UW-Madison's chemical engineering curriculum doesn't cover cross-border rescue operations, or negotiation with hostile nations. However, Don credits his time on campus for all of his successful exploits. His rigorous undergraduate experience helped him develop his work ethic, ingenuity and inventiveness. He even looks back fondly on the Saturday classes, *de rigueur* during the 1950s for engineers to complete the 151 credits required for graduation. In particular, instruction in transport phenomena from Professor Edwin Lightfoot

both thrilled and terrorized him because of the novelty of the field. "There wasn't even a book yet; we were the first groups going through with mimeographed pages. No one had done anything like this before and we were all learning something new," he says.

Now he hopes that the Baldovin-DaPra Professorship will enable a future faculty member to make seminal discoveries and train the next generation of Badger chemical engineers. He remains committed to supporting undergraduates as well, recognizing the value of financial support for students who, like him, hail from small rural towns. "The only way I was able to go to Madison was because of the scholarships that I got," he says.

Don's heritage inspired his optimism and hard-working attitude, which is why the professorship bears both his father's and mother's names. All four of his grandparents immigrated to the United States from Lozzo Cadore, a small town in mountains of Northern Italy. "They came to America for a better life and they all congregated in Northern Wisconsin," he says. "I'm thankful they came over, and I wanted to honor both my father's and mother's family."

Bluemkes' second professorship gift direct effect of Morgridge match

Alumnus Duane Bluemke (BS '55) and his wife Dorothy have been generous donors to the university for years, and a recent gift matching opportunity encouraged the Elm Grove, Wisconsin, couple to further their generosity. Among other gifts to the College of Engineering and the College of Agricultural and Life Sciences, the Bluemkes donated \$1 million a decade ago to sponsor a professorship for excellence in teaching in the College of Engineering.

Now, the Bluemkes have made another contribution to establish the **Duane H. and Dorothy M. Bluemke Professorship** in the department. Their donation followed an announcement by UW-Madison alumni John and Tashia Morgridge of a \$100 million matching gift to promote the creation of named professorships throughout the university. "Being able to participate in the Morgridge match provided a unique opportunity to create an additional professorship

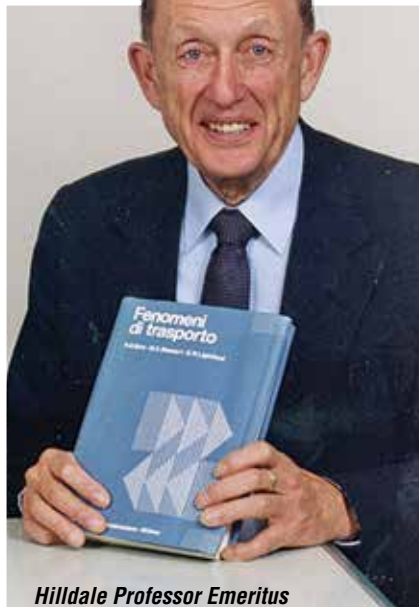
that Dorothy and I feel is essential," says Duane of the donation. "The state of Wisconsin has spent a tremendous amount of money for higher education," he says. "But the state cannot afford to support the outstanding researchers necessary to keep the university as a top research institution. Some of this funding needs to come from private gifts, and at this point UW must continue to be a top research university."

Duane says his entire career has been based on the foundation of his high-quality chemical engineering training here. In 2004, he sold his company, U.S. Counseling Services Inc., to Thermo Electron Corp., now known as Thermo Fisher Scientific. The company, which employed 110 at the time Bluemke sold it, provided maintenance services on high-tech equipment at hospitals and large pharmaceutical companies throughout the country. "This excellent education gave me a valuable start in

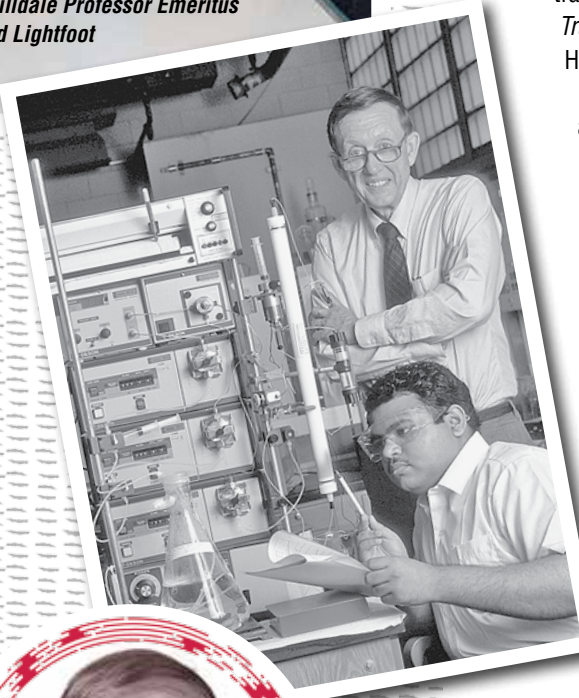


industry, which ultimately has allowed Dorothy and me to give at least something back to the UW," he says. "The university has been a tremendous positive influence on my life."

He says he and Dorothy hope other alumni follow their lead. "We want to motivate others to at least think about it," Duane says. "I don't think a lot of people really think about the advantages they got from the university."



**Hilldale Professor Emeritus
Ed Lightfoot**



CBE Hilldale Professor Emeritus Ed Lightfoot turns 90

Ed Lightfoot, who celebrated his 90th birthday in 2015, has been a world-class faculty member in the Department of Chemical and Biological Engineering at UW-Madison for more than six decades.

Ed, who was born in Milwaukee, attended Cornell University, where he received his BS and PhD in chemical engineering, in 1947 and 1950, respectively. From there, he worked as a research engineer for the Charles Pfizer pharmaceutical company in Brooklyn, New York.

He joined UW-Madison in 1953 as an assistant professor of chemical engineering, and established the first undergraduate curriculum in biochemical engineering at Wisconsin. He taught courses in biochemical engineering for seniors and graduate students, and was promoted to associate professor in 1957 and professor in 1961. In 1960, he and colleagues Bob Bird and Warren Stewart published the first edition of *Transport Phenomena*, a groundbreaking textbook that teaches concepts such as fluid flow, heat transfer and mass transfer. In 1974, he applied these ideas to biomedical issues in his book, *Transport Phenomena in Living Systems*. He was awarded the prestigious Hilldale Professorship in 1980, and became a professor emeritus in 1996.

Throughout his time at UW-Madison, Ed applied his knowledge across a variety of fields, reaching out to the UW-Madison medical school for research partnerships in environmental studies and building his understanding of stream aeration and biological oxidation of organic wastes in association with the Department of Civil and Environmental Engineering. One of the main goals of this work was to develop and refine medical devices and procedures for isolating fermentation-derived products. Toward the end of his career, Ed became increasingly interested in studying how biological processes were paralleled by certain systems in the chemical industry.

During his extensive career as a biochemical and chemical engineer, Ed remained strongly involved in the work of his students, supervising the thesis work of 49 PhD graduates. Today, these graduates are professors at leading universities, and key researchers in industrial biochemical and biomedical laboratories.

Ed has received numerous awards in his career. Among these are distinguished honorary degrees from the Technical University of Norway in 1985 and the Technical University of Denmark in 2000. He was elected to the National Academy of Engineering in 1979, and the National Academy of Sciences in 1995. In 1994, he was awarded the National Medal of Science by President George W. Bush for his innovative research and leadership in transport phenomena focusing on biochemical and biomedical engineering with application to blood oxygenation, bioseparation techniques, and diabetic responses.

He and his wife, Lila, now live in Madison. They have five grown children—Dory, Ted, Nancy, David and Robert.

SAVE THE DATE for a symposium in Madison to honor Ed: **APRIL 7-8, 2016.**

First-year graduate students spend endless hours troubleshooting tricky protocols, pondering paradoxical results, and studying the fundamentals of their field.

Additionally, many face the added anxiety of an uncertain funding climate, limiting their available avenues of research. Some promising future engineers, however, such as Tony Plauck, who now is a fifth-year chemical and biological engineering graduate student, receive fellowships to support them during their initial semesters of study.

R. Fenton-May fellowship helps grad students pursue fruitful research



The R. Fenton-May Wisconsin Distinguished Graduate Fellowship allowed Tony, during his first year, to plunge feet first into the research that ultimately became his thesis project, leading to a highly productive graduate career.

Chemical and biological engineering students enter graduate school at UW-Madison, but don't commit to a particular academic advisor right away. Rather, during their first few months, the students take classes, attend faculty seminars, and spend time learning about the different laboratory groups in the department before applying for a position under the mentorship of a professor with complementary research interests.

First-years rely on their faculty advisors to put them to work on projects with existing grant support. Additionally, the energy most first-years must devote to finding funding distracts them from generating data. Fellowships give them greater freedom in choosing the direction of research to pursue; however, the time-consuming process of writing national fellowship applications, says Tony, is "like putting together an entire additional set of applications when you're already in grad school."

For busy first-year students who are just starting to learn the techniques of the field and who lack established bodies of work, that search for funding stifles productivity.

Tony's first year, by contrast, was highly fruitful, setting the stage for what would become his thesis research. "I was really able to jump right in and immerse myself in the research group," he says.

He credits the R. Fenton-May Fellowship for facilitating his "seamless" transition from his first forays into computationally informed catalysis research to his current pursuit: a collaborative project with the Dow Chemical Company.

During his undergraduate studies at UCLA, Tony pursued research of materials that promote chemical reactions. He knew that he was interested in catalysis, but hadn't entertained the possibility of using computational tools to address the problem until encountering Vilas Distinguished Achievement Professor and Paul A. Elfers Professor Manos Mavrikakis' research. Now Tony uses a combination of calculations and experimental work done in collaboration with Vilas Research Professor and Michel

Boudart Professor Jim Dumesic's group to attack his research questions from multiple angles.

"I find myself running back and forth between working on my computer and in the lab," says Tony.

For a student who had his sights set on ultimately working in industry since day one, this broad variety of experiences has been invaluable to his career. "Having your hands in experiments expands your marketability as a computational scientist," he says.

The Dow Chemical Company, which offered Tony a full-time position after he defends his thesis in fall 2016, appears to agree with this assessment.

Looking back on his time at UW-Madison, Tony admits there were difficult moments. "Getting our experimental reactor up and running and calibrated was definitely a time sink," he says. "The moment we finally had something we could work with and start collecting data was a highlight of my graduate career."



Maravelias

Rawlings

Yin



Vilas awards honor department faculty

UW-Madison has recognized additional faculty members in the department with Vilas Distinguished Achievement Professorships:

- **Christos Maravelias, Jim Rawlings** and **John Yin** have joined Mike Graham, Dave Lynn, Manos Mavrikakis and Sean Palecek in receiving this recognition of faculty whose distinguished scholarship has advanced the confines of knowledge, and whose excellence has also included teaching or service.
- **George Huber** and **Eric Shusta** also received Vilas Mid-Career Investigator Awards.
- **Brian Pfleger** won a Vilas Early Investigator Award in recognition of his research and teaching excellence.

The awards provide flexible research funding of \$50,000 to \$75,000.

Huber

Shusta

Pfleger



FACULTY NEWS



In a finding with implications in fields as diverse as electronics and medicine, **Nick Abbott**, the John T. and Magdalen L. Sobota Professor and Hildale Professor, has reported in the journal *Nature Materials* that defects present in liquid crystals can be used as versatile templates to assemble molecules into useful and precisely defined 3D nanoscale structures. In other news, Nick's research on colloidal and interfacial phenomena involving liquid crystals, including new designs of stimuli-responsive soft materials, has earned him the 2016 American Chemical Society Award in Colloid and Surface Chemistry.

Research Professor **Bill Banholzer** recently received the Arthur M. Bueche Award from the National Academy of Engineering. The award honors an engineer who has made active contributions to science and technology, improving relations among industries, government and universities. Bill came to UW-Madison in 2013 after retiring from his position as executive vice president and chief technology officer of the Dow Chemical Company. Through his experience and industry perspective, Bill is working to improve university-industry relationships, highlighting the importance of innovation on campus.



Through his research over the past six years, **Jim Dumesic** has conceived and demonstrated a variety of elegant yet practical reaction paths and chemical processes for the efficient conversion of biomass to a variety of chemicals. This body of work earned Jim the 2015 Alpha Chi Sigma Award from AIChE, which recognizes outstanding contributions to fundamental or applied chemical engineering research. Jim's official "handle" has also changed to "Vilas Research Professor and Michel Boudart Professor." The Vilas Research Professorship is a campuswide award bestowed on faculty whose research

attracted national and international recognition for the university. Jim earlier received a professorship through WARF and elected to name it in honor of his major professor from his student days at Stanford, Michel Boudart.

Vilas Distinguished Achievement Professor and Harvey D. Spangler Professor **Mike Graham** has received the 2015 Stanley Corrsin Award from American Physical Society. The award recognizes influential contributions to fundamental fluid dynamics, and cited Mike's "novel research that provided fresh perspectives and laid the groundwork for the nonlinear dynamics of complex and multiphase fluids, including the interaction between polymer dynamics and turbulence, and the microhydrodynamics of complex and biological fluids."



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Under the sponsorship of the Chinese Academy of Science, Harvey D. Spangler Professor **George Huber** this past summer served as visiting professor at the Dalian Institute of Chemical Physics, the premier catalysis research institute in China. George presented seminars at 18 universities, institutes and companies. He visited several universities that Bob Bird visited in 1979 as part of a University of Wisconsin delegation to China after the Communist Party decided to reopen its universities and send the professors back to the universities from the country's farms.

Vilas Distinguished Achievement Professor **Christos Maravelias** and a multi-institutional team of co-authors received the Best Paper Award in *Computers & Chemical Engineering*. The journal's editorial advisory board chose Christos' paper, "Scope for industrial applications of production scheduling models and solution methods," which published online in the journal in late 2013. The paper also has been among the journal's most downloaded papers in a 90-day period.



Reporting in the journals *Nature Communications* and *Science*, Paul A. Elfers and Vilas Distinguished Achievement Professor **Manos Mavrikakis** and colleagues at Georgia Tech and elsewhere describe how they developed shape-selected core-shell alloy nanoparticles, and how they teased a small number of platinum atoms into hollow "cage" structures that prove to be many times as potent as conventional platinum particles in an oxygen-reduction reaction crucial to low temperature fuel cells. "The real significance of this research," Manos says, "is in offering a way to predict and synthesize new catalytic

materials, with the goal of replacing platinum and palladium with more affordable metals. The fundamental understanding of how these materials can form and how their reactivity can be modulated allows us now to go well beyond this pair of elements and explore other possibilities to go after even more potent catalytic materials."

Regina Murphy, the Smith-Bascom professor, was selected to participate in the National Academy of Engineering's seventh Frontiers of Engineering Education symposium Oct. 25-28 in Irvine, California. The event brought together an interdisciplinary team of engineering faculty members to develop innovative approaches to education. By sharing ideas and learning from each other, the team plans to sustain a dialog that will help the researchers bring about improvements in their home institutions. Regina and other attendees were nominated by the National Academy of Engineering members or deans in a highly competitive application process.



An interdisciplinary team of researchers, including Milton J. and A. Maude Shoemaker Professor **Sean Palecek**, have identified a protein that is integral to the survival and self-renewal processes of human pluripotent stem cells. Currently, most stem cell substrates are animal-derived and ill-defined. Using new gene-editing tools available through UW-Madison's Biotechnology Center, the research aims to develop a more controlled synthetic substrate that is less expensive and takes advantage of the cell's natural processes.

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LARRY BIEGLER (PhD '81), the Bayer University professor and head of the Department of Chemical Engineering at Carnegie Mellon, has won the 2015 AIChE William H. Walker Award for Excellence in Contributions to Chemical Engineering Literature. Larry's research through the Center for Advanced Process Decision-Making focuses on the development and application of concepts, algorithms and applications of optimization and numerical methods for process design, analysis, operations and control.

In early 2015, **JIM BIRCH** (BS '70) retired and closed Editech, the technical writing and editing firm he shared with his wife Ann F. Birch. They live in Bloomington, Indiana, where Jim plays golf, enjoys 10 grandchildren, is active in several church and prison ministries, and occasionally gets to see Badger sports teams in action.

JEFF CAMERON, a recent postdoc in Brian Pfleger's group and son of former faculty member Doug Cameron, has joined the Department of Chemistry and Biochemistry at the University of Colorado-Boulder. Jeff's research will focus on elucidating the principles and mechanisms underlying the spatial and temporal organization of photosynthesis in cyanobacteria and eukaryotic organelles using synthetic biology and microscopy.

KEN CARLSON (BS '82), professor of civil and environmental engineering at Colorado State University, reports that his research recently is focused on hydraulic fracturing and its impact on groundwater aquifers. Ken works extensively with industry to recycle oilfield wastewater for agricultural beneficial use in the arid west.

CHUCK GLATZ (PhD '75) retired in June after 39 years at Iowa State University's Department of Chemical and Biological Engineering. Chuck is a nationally recognized researcher in bioprocessing, with work in fermentation, product recovery and byproduct use. He served eight years as department chair and was named University Professor. He continues to reside in Ames, Iowa, pursuing multiple volunteer activities.

LARS GRABOW (PhD '08), assistant professor of chemical and biomolecular engineering at the University of Houston, has received several recognitions recently for outstanding research. He received a CAREER Award from NSF to explore a novel chemical looping process for methane coupling to transform natural gas into more valuable commodity chemicals such as ethylene. He earned the Best Fundamental Paper Award of the AIChE South Texas Section for work published in *Science* that demonstrated through theoretical and experimental means the central role that water plays in the catalytic oxidation of CO over gold nanoparticles. Finally, Lars received the University of Houston Junior Faculty Research Award in 2015.

HAROLD H. KUNG (BS '71), the Walter P. Murphy Professor of chemical engineering at Northwestern University, received AIChE's 2015 R.H. Wilhelm Award in Chemical Reaction Engineering. Harold's research focuses on novel catalytic materials reactions, which are integral parts of most environmentally friendly, energy- and material-efficient chemical processes, and on new materials for efficient energy storage, particularly electrical energy storage, that facilitates large-scale adaptation of renewable energy.

ETHAN LIPPMANN (PhD '12) started this fall as assistant professor of chemical and biomolecular engineering at Vanderbilt University after completing a postdoc with the UW Department of Biomedical Engineering and Wisconsin Institute for Discovery. Ethan's research interests lie at the intersection of engineering and regenerative medicine, with the goal of understanding neurovascular diseases and designing rational therapeutic strategies to combat their progression.

DAVID MURRAY (BS '09) has started a new position as senior polymer R&D innovation engineer at Nike IHM (in-house manufacturing, a wholly owned subsidiary of Nike Inc.) in Beaverton, Oregon. His focus is on process scale up, technology transfer, and

sustainable synthetic material development. Previously David was with Valspar and Ecolab in project and process roles.

JOHN PIERSON (BS '59) enjoyed a long career with battery manufacturer Globe-Union, later acquired by Johnson Controls. His many contributions to the improvement of lead-acid batteries and their manufacture were highlighted in a recent issue of *Batteries International*. Since retirement, John, who was dubbed a "hero of cutting-edge lead-acid battery-making," has worked as a consultant to battery manufacturers in Ecuador, Columbia, Brazil, Mexico and the United States.

ARGHAJIT ROY (BS '90) took up consulting in 2011 after 20 years serving industry in India and Southeast Asia. He is now director for business development and technology with SMS Chemicals & Process Consultants Pvt. Ltd. at Kolkata, India. He currently consults with Indian Oil Corporation, Ltd. on the up-gradation of low-rank Indonesian coal by drying, and solutions for a cheap low-ash, low-sulphur steam coal of optimum calorific value.

PHIL WOOLHISER (BS '64), reporting the twists and turns of his career, says that his ChE degree initially served wonderfully in ag chemical plant production. He then took a slight variance from direct use of the degree to a support function, leading to a master of environmental engineering. The ChE and master's degrees led to reverse osmosis and waste treatment activities. The resulting interface with government led to a huge detour into law school. Phil says that his BS, MS and JD have all worked well together, and he is now a sole practitioner in the active world of South Carolina litigation and real estate deals.

LINGCHONG YOU (PhD '02) leads a research group in the study of biological networks in biomedical engineering at Duke University. His group recently showed how the size of bacterial cells is regulated and how such regulation links to physiological processes, insights published in July 2015 in *Nature*.

VICTOR ZAVALA: Optimizing algorithms for the interconnected modern world

Flipping a lightswitch or turning on the oven are deceptively simple tasks. Every time a person illuminates a darkened room or bakes a lasagna, they draw electricity and gas from vastly complex distribution networks. Each house in a neighborhood, which might include hundreds of homes, places demand upon these networks. Multiple neighborhoods connect to make a city, in addition to the hospitals, high-rises, and office buildings requiring electricity and gas at all hours of the day. Cities across the nation draw energy from inter-linked transmission lines—and coordinating where to send resources at any given moment requires thousands of split-second calculations based upon massive amounts of data.

“At the national level, the problem explodes. There are many hundreds of thousands of gas and electric demand points,” says Victor Zavala, who joined the department in fall 2015 as the Richard A. Soit assistant professor.

Victor develops optimal control algorithms to manage the increasingly complicated, interconnected energy networks. His algorithms seek to overcome problems in existing systems, such as natural gas shortages during cold fronts (remember the polar vortex?), without investing in all-new infrastructure.

Instead of building new resource- and capital-intensive pipelines, transmission lines, or electrical substations and gas compression stations, Victor’s approach seeks to boost performance by better directing traffic along the established framework.

“We’re trying to use optimization to establish decision-making frameworks that allow you to resolve conflicts between stakeholders.”

“You can break a lot of existing delivery bottlenecks in a network just by better coordinating the supply and demand points in the network,” he says.

The spider web of power and gas lines spanning the United States might not, at first glance, seem to share commonalities with the silicon brain of a supercomputer. However, electricity transmission and parallel computing both involve convoluted networks with many dynamic competing demands. “The optimization problems that we solve to control gas and electricity flows can have billions of variables, but most of the time these variables do not appear in isolation. They follow well-defined patterns,” says Victor. “We try to identify these patterns to decompose the problem and parallelize computations.”

Ironically, the high-powered computers on which his algorithms depend require optimization themselves. According to Victor, computing processors aren’t getting much faster, but the modern world requires more and more complex calculations. In order to overcome existing limitations, parallel computing harnesses multiple mainframes to work together as one.

“We typically think that you can just throw a large and complex optimization problem at very large computers and because they’re very large they’ll be able to solve it faster,” he says. “However, these large computers are really clusters of computers. You have to make the best use of the available resources so these clusters can most optimally share the load.”

In addition to directing electrons along wires or gas through a pipe, optimization algorithms can help manage human behavior. Different stakeholder groups—for example, communities and government officials—considering a social or economic issue, such as where to install a bioreactor for breaking down manure, will have different competing

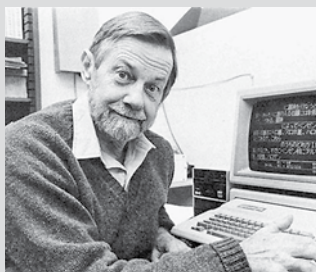


priorities. Right now, researchers don’t have ways of establishing feedback between the final decision and people’s preferences, says Victor. However, capturing individual preferences as inputs in a decision-making process aids in designing solutions that are not only efficient, but also acceptable to everyone involved. “We’re trying to use optimization to establish decision-making frameworks that allow you to resolve conflicts between stakeholders,” he says.

Wisconsin is home to a network of researchers who make up one of the strongest optimization groups in the world. Victor also speaks with reverence of UW-Madison’s long-standing tradition of excellence in chemical engineering research and education, noting that his current office once belonged to esteemed Professor Emeritus Edwin Lightfoot.

Victor arrived on campus after six and a half years working at Argonne National Laboratory. He maintains collaborations from his former position, and participates in the Multifaceted Mathematics for Complex Systems Project—a joint effort among industry, government laboratories, and universities across the country, including several faculty members at UW-Madison. His cooperative approach optimizes the problem of optimization research by bringing together the best possible resources from industry and academia to solve modern society’s most complex problems.

IN MEMORIAM



Professor Edward Daub



*By Professor Emeritus
R. Byron (Bob) Bird*

One of the ChE department's most creative and versatile alumni, Edward E. Daub, passed away on December 3, 2015. Ed served in the U.S. Navy in WWII and got both his BS and MS degrees in chemical engineering; he was a contemporary of Warren Stewart.

After leaving the UW, he attended Union Theological Seminary where he got his training to enter the ministry. While there, he married his wife, Liba, who survives him.

After the theological training, they left for Japan where he served as a minister in the Kansai area. After doing that, he was a part-time faculty member at Doshisha University, teaching chemical engineering.

Following a dozen or so years in Japan, he was offered a teaching job in the UW-Madison College of Engineering by Dean W.R. Marshall. In Madison, he established the first and, arguably, the most successful program in teaching technical Japanese translation in the United States. Later he translated several Japanese literary works into English.

Ed was one of the most energetic and scholarly graduates of our department. His spirit and sense of humor were remarkable.



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Spangler Professorships/Fellowships awarded

The legacy of the late Harvey D. Spangler (BS '56) continues with the appointment college-wide of three Spangler Professors and three Spangler Faculty Fellows.



In our department, **George Huber** has been named a Spangler Professor and plans to use the flexible funds he will receive to support a graduate student in his group to pursue high-risk research in the development of novel catalysts for conversion of biomass to fuels, chemicals and fertilizers.



Associate Professor **Jennie Reed** has been named a Spangler Faculty Fellow, and plans to expand her group's research in metabolic engineering into the area of enzyme engineering: identifying enzymes that limit metabolic rates, and then using

computational and experimental tools to improve their enzymatic activities. She will use the funds from her award to purchase supplies and equipment, enabling her students to develop data needed to compete for new grants.

Harvey Spangler earned a bachelor's degree in chemical engineering in 1956, and went on to work for companies including Exxon and Farmland Industries, developing ammonia-manufacturing plants and later managing business relations. In addition to the college-wide endowment fund in his name, Harvey endowed a departmental professorship, that is currently held by **Mike Graham**. Additionally, **Regina Murphy** holds one of the college's Spangler Professorships.