CHEMICAL ENGINEERING
UNIVERSITY of WASHINGTON

Benson Hall 105, Box 351750
Seattle, WA 98195-1750

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Catalyst

François Baneyx
Department Chair and
Charles W.H. Matthaei Professor

Shoko Saji
Writer and Editor

Jessie Muhm
Associate Director
College of Engineering Advancement

Send comments and address corrections to:
chechair@uw.edu
or to the return address above.

Website: www.cheme.washington.edu Reception: 206.543.2250

Catalyst

Company Information Sessions

Connecting employers with ChemE students

Is your organization interested in hiring UW ChemE students as interns or for permanent positions? Would you like to post a job opening, hold a company information session, or conduct interviews in Benson Hall? If so, our Academic Services team would love to hear from you!

Please contact Dave Drischell, Academic Services Director, at rdd@uw.edu.

2016 Distinguished Alumnus in Academia, Gabriel López

2016 R. Wells Moulton Distinguished Alumnus in Academia, Prof. Gabriel López (PhD '91), Vice President for Research and Professor of Chemical & Biological Engineering at the University of New Mexico, addressed ChemE students at the Annual Awards Day in April.

CHEMICAL ENGINEERING
UNIVERSITY of WASHINGTON

Fall 2016

Catalyst

IN THIS ISSUE

Leading the Way to a Sustainable Future

By Spencer Reeder

Society's view of sustainability has evolved a bit over the years. One definition suggests that sustainability is our collective ability to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. This definition can be expanded to include the balanced pursuit of environmental, economic, and social needs within this same multi-generational context.

As chemical engineers, we are trained to develop new products and optimize processes — sometimes to maximize output of a given product, or minimize the use of a particular feedstock. Thus, good engineering practice can often align with the principle of economic sustainability. However, how well are we preparing engineers to address the other two pillars? Societies tend to rely on good government regulations to inject the environmental and social constraints into our economic activities. We as engineers then collaborate with other disciplines to design and innovate around the most cost effective means to create breakthroughs while operating within these constraints.

It is evident that many of our brightest young people are motivated to tackle the world's most significant environmental and social challenges. Climate change is prominent among those. And central to the strategy of addressing climate change is accelerating the adoption of low- and zero-emitting technologies. These technologies can only be fairly evaluated by employing robust "lifecycle" calculations that consider the manufacture, operation, maintenance, and end-of-life disposal/recycling of the various components of the system under evaluation.

Earlier this year, transportation overtook electricity generation as the country's number one source of greenhouse gases. Even with the success of Tesla and the steady increase in model availability from other auto manufacturers, plug-in vehicles still represent less than one-percent of new car sales both in the U.S. and globally. How can this transformation be accelerated and emissions be lowered from this sector? It is clear that chemical engineers and material scientists have a critical role to play in this technology shift through the innovation of better performing (and more cost-efficient) batteries and lighter weight materials — but can we accomplish those technology breakthroughs and still meet the broader range of sustainability objectives? Certainly, consideration of battery raw materials and battery disposal will be key, but these are the very questions that society needs our chemical engineers to help address.

An important and comprehensive study recently released by Miotti, et al at MIT shows, for example, that the current vintage of battery plug-in all electric vehicles already outperform internal combustion and hybrid drivetrains on both an economic and greenhouse gas basis when considering the full lifecycle impacts. Chemical engineers are well positioned to contribute to these types of lifecycle analyses.

There are similar and related issues pertaining to the next generation of nuclear power, solar cells, carbon capture and utilization, aviation fuels, agricultural products, and many other important technologies. We must apply an expansive definition of sustainability and integrate that into these pursuits. The UW ChemE curriculum is already evolving accordingly to help our best and brightest illuminate the path forward. Although it may sound a bit cliché, the future of our planet does indeed depend on it. ■

Spencer Reeder *(BS '90) oversees the climate and energy portfolio within Paul Allen's philanthropy group at Vulcan. Reeder served as a climate-policy strategist in former Gov. Chris Gregoire's administration. He has conducted geophysical field research in Central Asia, South America and Antarctica. Reeder serves on the UW Chemical Engineering Advisory Board.*

Message from the CHAIR

François Baneyx

Beyond technical skills, creativity and adaptability, what differentiates a great engineer from a good one often boils down to the ability to anticipate the long-term consequences of design choices. In an era of rapid geopolitical shifts, accelerated technological development, and disruptive business models, this skill – let's call it sustainable thinking – is becoming increasingly necessary. It calls on consideration of the social, along with the economic, implications of engineering decisions, and on factoring in the ultimate gains brought about by waste minimization and pollution prevention. More importantly, as pointed out by alumnus Spencer Reeder in the cover article, the choices that chemical engineers make today impinge on generations to come.

The department has always been dedicated to undergraduate education and has evolved its curriculum to train the best possible workforce for today's needs. While continuing to teach the fundamentals of the discipline, we emphasize molecular and nanoscale phenomena, offer research experiences and internships to our students, and provide career path options through product and entrepreneurial design. A new initiative (see accompanying article by Prof. Holt) now seamlessly integrates sustainability concepts in the curriculum. This ubiquitous exposure to non-intuitive problems, life cycle inventory, and the impact of systems boundaries should go a long way in producing even more of those great engineers.

This year brought about many other exciting developments. Thanks to the generosity of Jeet and Jan Bindra and of the Weyerhaeuser Company, we recognized two of our brightest young faculty, Profs. Pfaendtner and Pozzo, with endowed professorships. Prof. Nance directed some of her boundless energy to the creation of WChE, a student-led organization that empowers women in Chemical Engineering. Prof. Pfaendtner received $3M from the National Science Foundation to establish a trailblazing graduate training program in data science for clean energy. The department held its first Science and Engineering as Art competition to awaken the artistic talents of our students. Our undergraduate entrepreneurial design teams took top honors at several business competitions and our faculty continue to amaze with groundbreaking research. Best of all, we are blessed with fantastic alumni who continue to care and invest in the department. We are, as always, grateful for your support and hope you will enjoy this issue of *Catalyst*.

Contact Chair Baneyx at chechair@uw.edu

More than a Buzz Word — Infusing Sustainability in the ChemE Curriculum

By Brad Holt, Associate Prof. & Associate Chair

Sustainability means many different things to many different people and the word has often been stretched beyond recognition to further one agenda or another. At its core, however, sustainability is an engineering concept: it speaks to always trying to make efficient use of resources – a natural playground for chemical engineers.

Recognizing the importance of sustainability and with strong support from the External Advisory Board, the faculty have been busy rolling out a *Sustainability in the Chemical Engineering Curriculum* initiative consisting of a signature course and the seamless integration of sustainability concepts relevant to the practice of engineering in all of our classes.

The concept of appropriate use of resources fits naturally in the chemical engineering curriculum and can be used to expose students to sustainability, starting with the very first ChemE course: *Material and Energy Balances*. In performing mass and energy balances, students learn how to define and draw the boundaries of the system they study. It is straightforward to extend the concept to the environmental impact of products and processes and to demonstrate how alternative definitions of the system and its boundaries affect outcomes. Examples include disposable vs. non-disposable cups, ethanol as a fuel and electric cars.

For years, the department has taught elective courses with a strong component of sustainability. We now have retooled ChemE 341, *Energy and the Environment*, to serve as a flagship class for the effort. The course delves into renewable and non-renewable energy production, energy usage and conservation. It also introduces elements of life cycle inventory and fosters multidimensional critical thinking on non-intuitive problems.

In their penultimate class, ChemE 485 *Design I*, students perform an abbreviated life cycle inventory, detailing all of the inflows and outflows associated with a process they choose, and discussing which has the most impact on the environment. In addition, they investigate the positive or negative consequences of transitioning the feedstock supply chain from one source to another (e.g., from shale gas to other potential methanol sources).

Students finally encounter elements of sustainability in their capstone design experience. Last year, for example, teams designed a process to convert carbon dioxide into liquid fuels; a key component of the project was a thorough evaluation of the economic feasibility and environmental impact of the design.

Between the first and last courses, faculty incorporate sustainability and environmental responsibility where they naturally fall in required courses. In thermodynamics, while learning about refrigeration cycles, students look at how the choice of a refrigerant will impact the ozone layer. In heat transfer, they calculate heat transfer efficiencies for a variety of designs and technologies. In separation, they learn about the energy costs associated with different separation technologies. In process control, they see how poor dynamic performance impacts efficiency. Finally, in surface and colloids, they learn how the science they study can be applied to lab wastewater clean-up and water purification.

The incorporation of sustainability into the curriculum is an ongoing effort and one we feel is paramount as students gain an appreciation for the bigger picture and learn how the decisions they make as engineers can have long-lasting impacts on the environment and society. ■

Bindra and Weyerhaeuser Endowed Professorships Installation

On October 13, the Chemical Engineering community gathered for a very special event: the installation of not one, but two endowed professorships. The honors were bestowed upon two outstanding Associate Professors: Jim Pfaendtner, as the inaugural Jagjeet and Janice Bindra Endowed Career Development Professor, and Lilo Pozzo, as the Weyerhaeuser Endowed Professor in Chemical Engineering.

"Private support such as these named endowed professorships play an important role in supporting and recognizing outstanding faculty like Jim and Lilo," said Mike Bragg, Frank & Julie Jungers Dean of Engineering. Named endowed funds equip faculty with discretionary funds to be used for supporting graduate students, travel, equipment or other expenses related to the success of their research labs.

From left: Chair Baneyx, Jeet Bindra, Jim Pfaendtner, Janice Bindra, Dean Bragg

Jeet (MS '70) **and Janice** (BA Spanish '70) **Bindra** have been tremendous supporters of the Department of Chemical Engineering and the College of Engineering. Jeet chairs the COE Visiting Committee and the Bindras have given generously to the department, establishing the Bindra Innovation Lab in Benson Hall and endowing a Graduate Fellowship. Standing in front of the ChemE community and his family and friends, Jeet thanked the ChemE professors who influenced him as a student and noted that this latest gift is "a small way to give back." The Bindra professorship will be held by Associate Professor **Jim Pfaendtner**. Prof. Pfaendtner is the recipient of the 2012 NSF Career Award, the 2013 University of Washington Distinguished Teaching Award, and the 2014 College of Engineering Faculty Junior Innovator Award. He recently won a $3M National Research Traineeship (NRT) big data for clean energy award from NSF to support graduate students in data science. "This professorship means I'll be able to support my students to attend more conferences and present our work, which is a really important experience for them. I'll wear the Bindra named professorship with pride and look forward to getting to know the Bindras further," Prof. Pfaendtner said.

From left: Chair Baneyx, Jack Winterowd, Lilo Pozzo, Dean Bragg

Weyerhaeuser has been a trusted partner of the College of Engineering for many decades and one of our most notable alumni, Steven Rogel (BS '65), formally served as President, CEO, and Chairman of Weyerhaeuser Company. We were honored to have **Jack Winterowd**, Chemistry Platform Manager of the Wood Products Research & Development Division and an alumnus of UW Forest Resources, represent the company for the celebration. The Weyerhaeuser Professorship will be held by Associate Professor **Lilo Pozzo**. Professor Pozzo is the winner of the 2013 Department of Energy Early Career Award and the 2013 University of Washington Outstanding Undergraduate Research Mentor Award. She was recognized by the National Institutes of Health with a $2.8M award for developing plasmonic technology suitable for imaging and busting blood clots. She is a leader in commercialization of technologies and has successfully spun off companies like Decaf Style and PolyDrop with her students through the ChemE entrepreneurship program. As Prof. Pozzo stated, "This professorship is equally about recognition of my students' work and we'll be able to take greater risks with our research." ■

- Shoko Saji

Inaugural 50th Reunion - Class of 1966

The Department of Chemical Engineering hosted its first-ever 50th reunion, welcoming back members of the class of 1966 to Benson Hall.

From left: Clay Radke, Dan Evans, Rich Eger, Nick Dobos

The reunion was held on June 9 in conjunction with the Chemical Engineering Graduation Ceremony. From the class of 1966, **Nicholas Dobos**, **Rich Eger**, **Clayton Radke** and **Dan Evans** were in attendance as well as Dan's spouse Sharon Bergman, Chair Emeritus Charles Sleicher, Emeritus Prof. Bill Heideger, Professor John Berg and Department Chair François Baneyx.

In recognition of 50 years of accomplishments, Chair Baneyx presented members of the Class of '66 with commemorative "stoles of gratitude" and recognized them by name during the graduation ceremony that followed. The conversation started with the whereabouts of former classmates and moved on to recollection of fond memories. Like many chemical engineers, they had stories of how they got into trouble by letting their creativity run a little bit too far.

Dan Evans recalled the time when fire erupted in a lab. "It shot up all the way on the walls! The TA almost broke his leg trying to extinguish the fire," said Evans who later addressed the Class of 2016 at the ChemE commencement.

Nick Dobos remembered the time when his lab members were fined for "magically missing" ethanol. "The TA told us, 'Don't drink it – it's 200 proof and you'd be dehydrated.' but we made Hawaiian punch with it anyway," Dobos said.

Clayton Radke chimed in with his story about an incident in a physics chemistry lab when an air hose exploded with perfect timing as the chair of the Chemistry Department was walking through with dignitaries. "Oh the Chair did not like that at all…" Radke said. "Then the Chair said, 'It's ChemE again!'"

Having shared their troublemaker stories, the group compared today's chemical engineering education with theirs.

"I used to constantly take things apart and that's part of how I learned to be an engineer," Baneyx said. "You can't really do that with iPhones today."

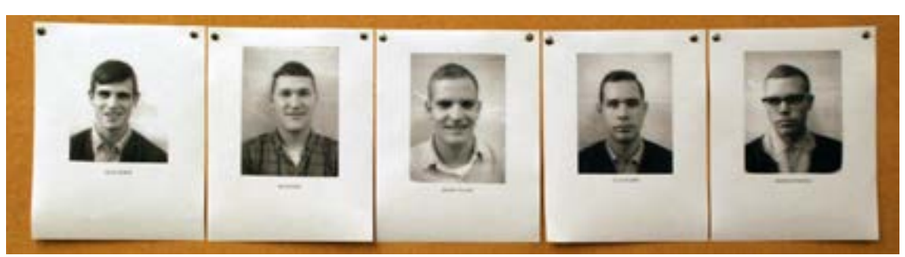
Radke told a story about a former graduate student who worked as a truck driver. One day, he called Radke that his truck died and he was stuck on the road. "But guess what? He fixed the blown up engine himself and drove back." "Having a sense of things – it's important for engineering thinking." Without computers, Google, or even calculators in the 60's, students relied heavily on math skills until it got "into the psyche."

All agreed that today's students are much savvier in finding information. "The quality of students is as high as ever," said Prof. Berg, who celebrates his 52nd year of teaching this year. "There is almost no one in my class who does poorly."

The event included a surprise from Berg who invited the guests to the recently inaugurated John C. Berg Interfacial and Colloid Science Lab. Cheers and laughter erupted as the group walked into the lab and saw the headshot photos of younger selves posted on the board.

We look forward to sharing the memories of the class of 1967 next year. ■

- Shoko Saji



From left: Nick Dobos, Rich Eger, Dan Evans, Clay Radke, Dennis Strenge

CHEMICAL ENGINEERING

LEADERSHIP SEMINAR SERIES

- Maryann Einarson (PhD '92), Former CEO & President, Integrated Technologies
- Jay Hecker (PhD '82), Anesthesiologist, Harborview Medical Center
- Linda Hedges (BS '82), HPC Principal Solutions Architect, Amazon Web Services
- Hassan Madani (PhD '89), Director CMC Commercialization, Alder Pharmaceutical
- Ray Marzullo (BS '69), Retired Vice President, Customer Support for the Americas, Boeing
- Jeff Thomas (PhD '98), Director Intellectual Property Counsel, Caris Life Sciences
- Saran Poovarodom (PhD '10), Engineering Manager, Intel
- Christophe Poulain (PhD '95), Sr. Research Software Engineer, Microsoft
- Ryan Reed (BS '04), Chief Technology Officer, Hesco Armor

The Leadership Seminar Series, now in its tenth year, provides an interactive forum for undergraduate and graduate students to learn from industrial, academic and governmental leaders. Lectures cover a variety of topics in the chemical engineering profession including career planning, management, entrepreneurship, ethics, effective planning, interpersonal skills and strategic decisions. LSS explores the depth and breadth of a ChemE degree and the careers that follow. Thank you to the alumni who took part in this year's LSS!

Class of 1967 50th Reunion

Calling all members from the **Chemical Engineering Class of 1967**! We hope you will join us for your 50th reunion held in conjunction with the 2017 Chemical Engineering Graduation. Come back to campus to reconnect with classmates, visit with faculty, and be formally honored during the graduation ceremony. An official invitation with all of the details will be mailed in early spring. Please contact Kaitlin Colleary, Assistant Director of Advancement at kaitcoll@uw.edu or 206-685-6192 with any immediate inquiries.

2016 Distinguished Alumnus in Industry, James Chang

We are pleased to honor Dr. James Chang (Ph.D. '86) with the 2016 R. Wells Moulton Award for Distinguished Alumnus in Industry.

James Chang and his family with Chair Baneyx and Jessie Muhm

Since 1993, the R. Wells Moulton Distinguished Alumnus Award has been presented to alumni who have made exceptional contributions in industry, academia, government or public service.

The 2016 recipient of the industry award, **James Chang**, is the CEO of TaiMed Biologics, a publicly traded company in Taiwan with a U.S. subsidiary. TaiMed focuses on developing monoclonal antibodies for the treatment of HIV / AIDS infection. James started his career at Procter & Gamble and later became Senior Director at Allergan Pharmaceuticals where he played a key role in BOTOX® development.

James received his Ph.D. in 1986 under the direction of Professor Eric Kaler. He delivered a seminar entitled "Career Paths in Pharmaceutical/Biotechnology Industries: A Chemical Engineer's Perspective "during the 2014 Leadership Seminar Series. James is a strong supporter of the department. His generosity stems from his deep gratitude for the fellowship he received while pursuing his Ph.D. and his strong belief in giving back. We congratulate James on joining the prestigious cohort of Moulton award recipients. ■

SEA: Science & Engineering as Art

From left: "Planets Escaping" by Kannan Aravagiri, "Exciting Colors" by Brittany Bishop, "Christmas in a Petri Dish" by Brittney Hellner

Chemical engineering is more than math. Research images can captivate our minds and expand our imagination.

Chemical Engineering students engage in innovative research with world-class faculty but they are more rarely asked to draw on their artistic talents. We asked both undergraduates and graduates to showcase their creativity by altering and coloring research images captured in ChemE labs, and giving them clever titles and descriptions. The results were nothing short of amazing.

We received a total of 17 entries and the committee had the arduous task of picking the following winners who received cash prizes thanks to the generosity of alumna **Dorothy Bowers** (B.S. '69):

1st Prize - Brittany Bishop for "Exciting Colors"
2nd Prize - Brittney Hellner for "Christmas in a Petri Dish"
3rd Prize - Kannan Aravagiri for "Planets Escaping"

Art work produced during the inaugural and subsequent SEA competitions will adorn the walls of Benson Hall and make a long lasting impact beyond research. Visit cheme.washington.edu/news/2016_SEA to experience the masterpieces firsthand. ■

Planned Gift: Harry and Lynn Glaze

Harry (MS '57) **and Lynn Glaze** believe in the importance of training more talented engineers to enter the workforce and in the quality of education they can receive at the UW. With this in mind, the couple has elected to make a planned gift by establishing a charitable remainder trust to benefit the Department of Chemical Engineering. This legacy will create the Harry Glaze Endowed Fellowship. To Harry, the decision was a no-brainer.

"While I was a graduate student at the UW, my education was all but free. Since the university was so good to me, I would like to give something back and help future graduate students. Establishing this trust allows me to do more with my money today, providing me a source of steady income until the time that I no longer need it. I will be pleased to have the UW receive the principal of the trust upon my passing."

> "Since the university was so good to me, I would like to give something back and help future graduate students.

Planned gifts like the Glazes' provide creative and flexible strategies for your estate and charitable planning – they can include bequests, real estate and annuities. Some planned gifts provide you with income and many can reduce your taxes. The greatest benefit, however, lies in knowing you are supporting the work in Chemical Engineering and ensuring our students have access to an outstanding chemical engineering education.

Supporters who choose to establish a planned gift during the UW's current campaign, *Be Boundless – For Washington, for the World*, are eligible for certain recognition and benefits. To learn more, please contact Jessie Muhm at jmuhm@uw.edu or (206) 685-7748.

Bay Area Alumni Reception

Tony Huang (BS '82, left) and Jon Bagg (BS '71, right) with graduate student Brittney Hellner

Graduate students with Shuman Mitra (BS '93, middle) and Vance Jaeger (PhD '15, right)

In conjunction with the November AIChE meeting, the Department hosted a reception to connect with Bay Area alumni. Attendees gathered in Berkeley included alumni **Jon Bagg** (BS '71), **Denny Roja** (MS '69) and **Tony Huang** (BS '82). In addition to Profs. DeForest and Carothers, ChemE graduate students presenting at the conference were also in attendance. Among them were Wesley Beckner and Kayla Sprenger from the Pfaendtner Group, Erik Liu, Andy Sinclair and Peng Zhang from the Jiang Group, and Brittney Hellner and Jessica Soto-Rodriguez from the Baneyx Group. "We wanted to create an opportunity for Bay Area alumni to meet new faculty and students and learn of the state of the department. Alumni are a big part of the ChemE community and the opportunity for our students to network with them is invaluable," Chair Baneyx said. ■

Connect with ChemE

For news, events, research highlights, student & faculty achievements and more, visit us at:

www.cheme.washington.edu

LinkedIn

Endowment: Scott and Cathi Roberts

Lifelong community volunteers and philanthropists, **Scott** (PhD '74) **and Catherine Roberts** are dedicated to numerous causes, from supporting Amigos de las Americas in a variety of capacities to advocating for the preservation of African Heritage Cultural Resources. But above all, their passion is investing in the future by helping young people to achieve their potential. This passion was their motivation for establishing the Catherine and Scott C. Roberts Distinguished Endowed Graduate Fellowship in Chemical Engineering.

> "Our priority is helping programs that grow leaders for the future."

Scott and Cathi typically make current-use gifts, but were inspired to create an endowment by the UW's recent matching program, which increased the value of their $500,000 gift by 50 percent. The fellowship also honors Scott's mentor, Professor Graham Allan, whose focus on creative thinking helped Scott to distinguish himself from other young chemical engineers as he began his 35-year career with Royal Dutch Shell.

"The research support I received from the UW for my graduate studies was so important to us; without it, I couldn't have attended. We really appreciated it and would like to pass it on. And Chemical Engineering is an outstanding department; students who are lucky enough to earn their Ph.D. there are really going to do great things. So if we can help with the fellowship, that's a great investment." — Scott Roberts

"We want to invest our money with people who are making positive changes in the world. Our priority is helping programs that grow leaders for the future." — Cathi Roberts

Student Achievements

Graduate Students

- ACS COMP Graduate Student Award, AIChE Biomaterials Graduate Student Award, AIChE CoMSEF Graduate Student Award: *Kayla Sprenger*
- Electrochemical Society Norman Hackerman Young Author Award: *Trevor Braun*
- Faculty Lecture Award: *Peng Zhang*
- High Impact Publication Award: *Tao Bai*
- Lawrence Award: *Yanbo Qi*
- McCarthy Teaching Awards: *Steven Adelmund & Brian Gerwe*
- UW ACES Graduate Student Symposium
  Poster 1st place (tie): *Matthew Crane & Ryan Stoddard*
  Talk 1st place: *Jared Shadish*, 2nd place: *Kayla Sprenger*
  CEI Best Clean Energy Research in ChemE: *Matt Murbach*

Undergraduate Students

- UW Student Regent: *Austin Wright-Pettibone*
- UW ChemE Bowen Design Awards
  Grand prize: *Designin' II: Exergetic Boogaloo*
  (Bennett Battistoni, Max Calcagno, Jacob Hatzinger, Austin Im)
  Other winners:
  Pirates of Ross Island (Graham Henry, Victoria Hildreth, Connor Zeleny)
  Carbon Cowboys (Jalen Son, Jinsung Kim, Smira Shaar)
  Alex Liqui-Fuelers (Brendan Cysewski, Nick Ivarson, Melissa Le)
- AIChE Chem-E Car Competition Poster 2nd place:
  Pash Shamaprasad, Tad Lienjaya, Victoria Hildreth, Heather Huang, Yu Chen Liu, Sam Smith, Matt Willet

Graduate & Undergraduate Teams

- UW Foster School of Business Plan Competition
  2nd place & Best Retail Innovation Idea:
  Decaf Style (Pozzo)
  (Chuchia Kao, Archana Narayan, Yu-Liang Liu, Muhamad Said, Matthew Willet)
  Clean Tech Prize:
  Ionic Windows (Pozzo)
  (Greg Newbloom, Anthony Moretti, Ian Hochstein)
  Best Consumer Product Idea:
  Coulomb Sea (Schwartz & Subramanian)
  (Yanbo Qi, Yutian Qian, Samson Smith, Niccolo Fortes, Nannan Jiang)

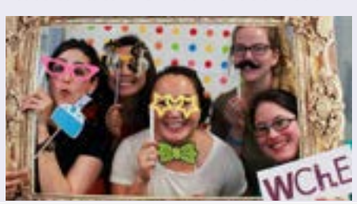
WChE
WOMEN IN CHEMICAL ENGINEERING
wche@uw.edu @wcheuw
students.washington.edu/wche

WChE Women's Networking Session

"Did you all know women leave Chemical Engineering, Mechanical Engineering, and Industrial Engineering professions more than any other fields? I want us to do something about that," said **Elizabeth Nance**, Clare Boothe Luce Assistant Professor of Chemical Engineering, to students gathered at the first WChE meeting in January. Prof. Nance, along with an elected group of ChemE students, founded *WChE - Women in Chemical Engineering @ UW*. Their mission is to educate and empower women in chemical engineering, and their supporters, by providing a safe and open space for dialogue, advocacy, mentorship, collaboration, camaraderie and skill building.

In less than a year, WChE has organized a women's networking session, a graduate student panel, the first ChemE senior send-off, started CheMentoring Circles, and partnered with the Society of Women Engineers, Time To Invent and the UW Graduate School. On November 10th, WChE hosted their biggest event yet, *The 1st Annual Fall Industry Panel*, featuring chemical engineering women who are industry leaders. ChemE alum **Bridgette Rosendall** (PhD '96), recent awardee of the VIP Woman of the Year by the National Association of Professional Women, and **Jill Seebergh** (PhD '95, MS '91), Technical Fellow at The Boeing Company and a longtime supporter of the department, were among the panelists.

WChE is actively recruiting ChemE alumni to support their efforts. Please contact WChE at wche@uw.edu. ■



Student UPDATES

Inspire New Ideas
Support Chemical Engineering

Now more than ever, a dynamic education requires the involvement and investment of many. It no longer happens with just tuition dollars. Private support is essential to our success. Endowed scholarships, fellowships, professorships and chairs, along with flexible unrestricted gifts can translate into real opportunities for our students and faculty. Our continued success depends on your partnership.

To learn more about supporting Chemical Engineering, please contact Jessie Muhm at jmuhm@uw.edu or 206.685.7748.

Austin Wright-Pettibone is having quite a year which culminated in being selected as the first-ever engineering student to serve on the UW Board of Regents. He conducts research in the Carothers Lab and is supported by The Armstrong Scholarship and The Bernice Frank Scholarship in Chemical Engineering. He was recently featured as one of six students embodying the Husky Experience.

I got plugged into President Obama's campaign when I was in high school. It was such a rush of excitement to be able to not just witness history, but be part of making changes in our society. I think that's one of the great things about getting involved with the political process. My time volunteering led to an internship at the White House my freshman year. I started the week before Obama's second inauguration, and got to help with everything from social media to the State of the Union. It was an amazing opportunity.

Just recently, Governor Inslee appointed me to the Board of Regents, which is a huge honor. The UW changed my life. Beyond teaching me a whole lot, it's made me a better person, a better leader, and someone who feels a strong commitment to the state and to the University. To me, being selected is about ensuring everyone who comes to the University has an experience as good as — or better than — mine. I want to share with people the same sense of wonder and excitement I feel.

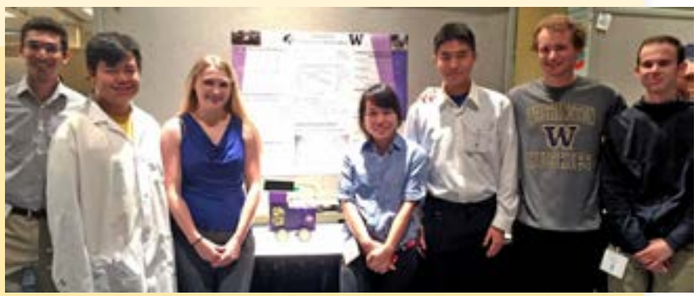
> "I want to do work that makes a difference in society, impacts people daily, and informs the direction of our country."

I worked as an undergraduate researcher in the Carothers Lab. I like to explain our work as if we're flipping a light switch in E. coli in order to get the bacteria to produce industrial plastics. The goal is to sustainably produce chemicals through engineering controls in bacteria. Of all the engineering disciplines, it's chemical engineering that really sits at the intersection between science and society — there are giant public benefits that can come from research like this.

Scholarships are all about creating access and opportunity for students. When you receive a scholarship, it's saying that somebody believes in you and wants to invest in you so that you can go out and make the difference you want to make in the world. In one part it's about validation, but it's also about giving you opportunities you may not have otherwise. ■ *University Marketing & Communications*

ChemE Car at AIChE

AIChE's annual Chem-E-Car Competition® engages college students in designing and constructing a car powered by a chemical energy source that will safely carry a specified load over a given distance and stop. This year, the UW Team (advisor: Prof. Adler) beat the tough regional competition and participated in finals at the AIChE meeting in November. The team's effort to optimize the car until the last minute unfortunately resulted in a technical difficulty that prevented them from making a successful run. But all was not lost. The UW Team won second place in the poster competition, behind a fellow Pacific Northwest rival UBC. Our students stood out by providing technical details about the design process and philosophy. Check out their video journey in the news section of our website.



UW ChemE Car Team (from left): Pash Shamaprasad, Tad Lienjaya, Victoria Hildreth, Heather Huang, Yu Chen Liu, Sam Smith and Matt Willet

2016 Bruce A. Finlayson Lecture Features Ed Cussler

Prof. Cussler at the 2016 Finlayson Lecture

The Lecture, named in honor of Bruce A. Finlayson, Rehnberg Chair Professor Emeritus of Chemical Engineering, features distinguished chemical engineers who demonstrate exceptional scholarship, teaching and service in their field.

The **2016 Finlayson Lecturer** was **Prof. Edward L. Cussler**, Distinguished Institute Professor at the University of Minnesota. Prof. Cussler received his B.E. with honors from Yale University in 1961, and his M.S. and Ph.D. in Chemical Engineering from the University of Wisconsin in 1963 and 1965, respectively, working with E. N. Lightfoot. After thirteen years teaching at Carnegie-Mellon University, he joined the University of Minnesota in 1980. He has written over 250 articles and five books, including Diffusion, Bioseparations, and more recently, Chemical Product Design. Prof. Cussler has received the Colburn and Lewis Awards from the American Institute of Chemical Engineers (AIChE), for whom he served as Director, Vice President, and President. He has received the Separations Science Award from the American Chemical Society, the Merryfield Design Award from the American Society of Engineering Education, and honorary doctorate degrees from the Universities of Lund and Nancy. He is a Fellow of the American Association for the Advancement of Science and a member of the National Academy of Engineering.

Prof. Bruce Finlayson

Prof. Cussler delivered two lectures: *A Sustainable Chemical Industry May Imply Dispersed Manufacturing* (research) and *Will Swimmers Swim Faster or Slower in Syrup?* (public). ■

Faculty Honors and Achievements

Stu Adler has co-developed a new technique for designing better batteries which was featured on the cover of the May 28 issue of the Journal of Applied Physics.

François Baneyx was elected to the Washington State Academy of Sciences.

John Berg was honored at the University of Florida as the 2016 D. O. Shah Annual Lecturer.

Cole DeForest was named a 2017 PMSE Young Investigator by the Polymeric Materials Science & Engineering division of the American Chemical Society.

Hugh Hillhouse's laboratory was visited by U.S. Secretary of Energy, Dr. Ernest Moniz, for their innovations on photovoltaic materials and solution processed solar cells.

Shaoyi Jiang edited a special issue of *Acta Biomaterialia* on zwitterionic materials featuring a selection of papers presented at the *2nd International Conference on Bioinspired and Zwitterionic Materials* he organized in 2015.

Elizabeth Nance founded and is serving as advisor to the WChE (Women in Chemical Engineering) which educates and empowers women in chemical engineering and their supporters.

Jim Pfaendtner was named the inaugural Jagjeet and Janice Bindra Endowed Associate Professor and won a $3M NSF-NRT grant to bring big data to graduate education in clean energy research at UW.

Jonathan Posner's start-up company, Vie Diagnostics, co-founded with his students, won a $225K NSF Small Business Technology Transfer grant.

Lilo Pozzo was named the Weyerhaeuser Endowed Associate Professor.

Dan Schwartz was elected to the Washington State Academy of Sciences.

Venkat Subramanian was promoted to Professor and was selected as a Technical Editor of the Journal of Electrochemical Society.

Hillhouse with U.S. Secretary of Energy, Dr. Ernest Moniz

Graduate Education in Clean Energy due for "Big Data" Overhaul

Led by Prof. Jim Pfaendtner, the $3M National Research Traineeship grant from the National Science Foundation brings "Big Data" to graduate education in clean energy research at the University of Washington.

Automation, advanced instrumentation and high-performance computing have revolutionized science through an exponential growth in data.

Materials scientists, chemists and engineers seeking to discover next-generation materials for energy are stymied by this abundance of information. "Big data" has an intoxicating allure, since the answers are in there — somewhere. But finding them requires new tools, techniques and approaches specifically designed for large datasets.

"In science today, people have big datasets collected from computers, instruments, microscopes," said Jim Pfaendtner, associate professor of chemical engineering at the University of Washington. "It's not the amount of data we can collect that's the limiting factor. Now the limiting factor is data-handling."

Removing the logjam requires an overhaul in educating young scientists, and Pfaendtner is leading a new endeavor funded by the National Science Foundation, via its new flagship National Research Traineeship (NRT) program, to bring big data to graduate education in clean energy research at the UW. Known as DIRECT — or Data Intensive Research Enabling Clean Technologies — this traineeship will phase in practical, data-driven research projects for graduate students in fields such as chemistry, renewable energy and chemical engineering.

"There's been a recent 'explosion' of data in these fields, and we need new approaches to help our graduate students grow into data-intensive researchers in these subjects," said Pfaendtner, who is also a member of the UW's Clean Energy Institute and the Molecular Engineering & Sciences Institute.

Masters and doctoral students in four UW departments — materials science and engineering, chemistry, chemical engineering, and human centered design and engineering — will participate in DIRECT, as well as the Clean Energy Institute (CEI), the Molecular Engineering & Sciences Institute (MolES) and the eScience Institute. The program will match students with short, goal-driven projects in renewable energy or materials science early in their graduate education.

This project will not replace independent thesis or dissertation research. Instead, students will work temporarily on a big-data project already underway at UW or a partner institution. Graduate students will learn as they go how to handle, organize and analyze large datasets, both furthering the project and boosting their analysis toolkits for their own master's or doctoral research projects.

Bindra Associate Professor Jim Pfaendtner

"These are not classroom exercises. These are not simulations. These projects will support ongoing research," said Pfaendtner. "Graduate students completing our classroom training will be ready to do this, and learn as they go from senior scientists."

For example, one graduate student could help develop machine-learning approaches to predict the properties of new materials that have not yet been produced. Her classmate might explore new methods to synthesize the next generation of light-harvesting solar cells. Pfaendtner envisions pairing students with projects that fit their interests, though he stresses that the skills they would acquire would be applicable across the physical and engineering sciences.

"Whether students move on to do experiments, simulations or modeling for their research, the big-data skills they learn here will be invaluable," he said.

Partner institutions, which will field projects for DIRECT, are the Pacific Northwest National Laboratory, Boeing Research and Technology, Zhejiang University in China, the University of Campinas in Brazil and Bellevue College. The $3,000,000 in support from the NSF for the five-year NRT project is also supported by the UW to allow additional students to participate and leverage the grant to improve the diversity of doctoral students entering the UW to do clean energy research.

Pfaendtner's co-principal investigators on DIRECT are associate professor of human centered design and engineering Cecilia Aragon, chemistry professor David Ginger, chemistry professor Xiaosong Li and professor Christine Luscombe in the Department of Materials Science & Engineering. Aragon is also a member of the eScience Institute, while Pfaendtner, Ginger, Li and Luscombe are members of the CEI and the MolES Institute. ■

James Urton, UW News and Information