The TREND in Engineering

THE UNIVERSITY OF WASHINGTON COLLEGE OF ENGINEERING NEWSLETTER Autumn 2013

A New Dean for Engineering

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A NEW BEGINNING

In July, I arrived at the UW as the new dean of the College of Engineering. I am honored to assume this role at such an outstanding institution. The best measure of a college is the quality of the faculty and staff, and the students it graduates and attracts. By this measure, all that I have observed about UW Engineering is that it is indeed an exceptional place with a very bright future.

The last five years have brought major challenges to the college and to public higher education across the country. For engineers, challenges also mean opportunities to innovate and I am impressed by the entrepreneurial spirit here. The college is poised to meet the needs of our community by graduating more engineers and serving more students. The new state budget is a turning point in state support for higher education and in particular for engineering.

In October, the College of Engineering is partnering with the Pacific Northwest National Laboratory and the Council for Competitiveness to present a National Engineering Forum Regional Dialogue. These forums are being held across the country to address three engineering challenges in the U.S.: the capacity of our technical talent to fill current and future jobs; our engineering workforce's capability to address 21st century challenges; and our nation's competitiveness on the world stage.

Our faculty provide a quality research and educational experience for our students while often spinning out companies of their own. This fall we're thrilled to welcome 20 talented new faculty members to campus. We're also looking forward to welcoming a new class of students to the UW. The energy and enthusiasm of our students are invigorating and remind me of our mission – to prepare the engineers of the future.

As the product of great public research universities much like the UW, I am deeply committed to building on the strengths of this wonderful institution that transforms lives and plays a vital role in the success of our state and nation. A new initiative that we're excited to launch this fall is the Washington STate Academic Redshirt program, or STARS. STARS will help lower-income students succeed in engineering by providing them with an extra year of preparation in math, science, and the humanities. We are committed to expanding access to an engineering education and this program is an important step in that direction. You can read more about this program on page six of this issue.

I couldn't be more pleased to join this extraordinary team and help guide UW Engineering as we forge ahead in research and educating tomorrow's leaders. Alumni play an important role in a university and I look forward to meeting you, our Washington engineers.

Mike Bragg
Frank & Julie Jungers
Dean of Engineering

Banner Year for Faculty Recruitment

Twenty exceptional new faculty members will join the college this year. We highlight two below. Meet them all at www.engr.uw.edu/newfac2013

Maya Cakmak
Computer Science & Engineering

Since receiving her PhD in Robotics, Maya Cakmak has been working as a post-doctoral research fellow at Willow Garage–one of the most influential robotics companies in the world. She is currently working on a general-purpose robot that users can customize to their needs, such as domestic assistance, eldercare and manufacturing. Her work has been covered by numerous media outlets, including *National Geographic, The New York Times* and *NOVA Science*.

Cole DeForest
Chemical Engineering

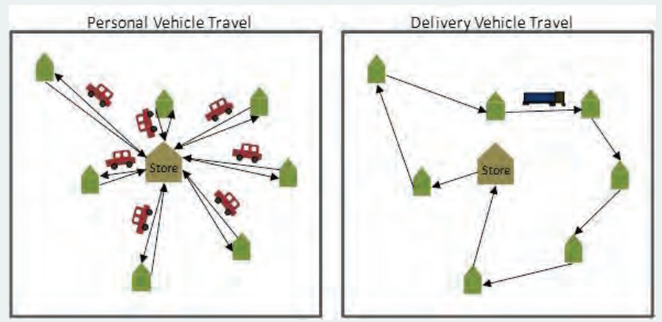
Cole DeForest joins us from the California Institute of Technology where he is a postdoctoral researcher. His research focuses on novel biomaterials that self-adapt to their environment to create functional human tissue. He is currently developing an engineered protein therapeutic that can program its delivery system with light, offering promising solutions to the treatment of chronic illnesses as well as early stage detection of disease.

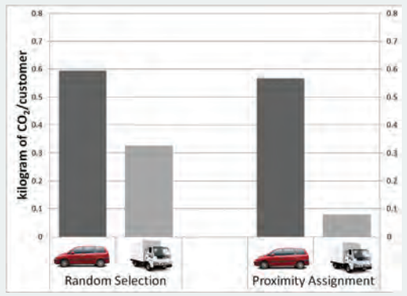
Grocery delivery service is greener than driving to the store

By Michelle Ma

At the end of a long day, it can be more convenient to order your groceries online while sitting on the couch instead of making a late-night run to the store. New research shows it's also much more environmentally friendly to opt for groceries delivered to your doorstep.

UW engineers have found that using a grocery delivery service can cut carbon dioxide emissions by at least half when compared with individual household trips to the store. Trucks filled to capacity that deliver to customers clustered in neighborhoods produced the most savings in carbon dioxide emissions.





"A lot of times people think they have to inconvenience themselves to be greener, and that actually isn't the case here," said Anne Goodchild, UW associate professor of civil and environmental engineering. "From an environmental perspective, grocery delivery services overwhelmingly can provide emissions reductions."

Consumers increasingly have more grocery delivery services from which to choose. As companies continue to weigh the costs and benefits of offering a delivery service, Goodchild and Erica Wygonik, a doctoral candidate in civil and environmental engineering, looked at whether using a grocery delivery service was better for the environment, with Seattle as a test case. In their analysis, they found delivery service trucks produced 20 to 75 percent less carbon dioxide than the corresponding personal vehicles driven to and from a grocery store.

They also discovered significant savings for companies – 80 to 90 percent less carbon dioxide emitted – if they delivered based on routes that clustered customers together, instead of catering to individual household requests for specific delivery times.

"What's good for the bottom line of the delivery service provider is generally going to be good for the environment, because fuel is such a big contributor to operating costs and greenhouse gas emissions," Wygonik said.

Emissions reductions were seen across both the densest parts and more suburban areas of Seattle. This suggests that grocery delivery in rural areas could also lower carbon dioxide production quite dramatically.

"We tend to think of grocery delivery services as benefiting urban areas, but they have really significant potential to offset the environmental impacts of personal shopping in rural areas as well," Wygonik said.

Work commuters are offered a number of incentives to reduce traffic on the roads through discounted transit fares, vanpools and carpooling options. "Given the emissions reductions possible through grocery delivery services, the research raises the question of whether government or industry leaders should consider incentives for consumers to order their groceries online and save on trips to the store," Goodchild said

Nominate an Exceptional Engineer for a Diamond Award

The Diamond Awards honor outstanding alumni and friends who have made significant contributions to the field of engineering. If you know an engineer who deserves recognition, we want to hear from you! Take time to nominate an engineer to join the distinguished ranks of Diamond Award honorees. Deadline for nominations is Friday, October 18. www.engr.uw.edu/da

Meet MIKE BRAGG

By Jennifer Langston

Michael B. Bragg

Frank & Julie Jungers Dean of Engineering, University of Washington

Age: 59

Hired from: University of Illinois at Urbana-Champaign

Positions held there: Interim Dean; Executive Associate Dean for Academic Affairs; Associate Dean for Research and Administrative Affairs; Head, Department of Aerospace Engineering; Professor, Department of Aerospace Engineering

Education: Ph.D., Aeronautical and Astronautical Engineering, The Ohio State University

B.S. and M.S., Aeronautical and Astronautical Engineering, University of Illinois at Urbana-Champaign

Research Focus: Aircraft icing

Selected Awards: Fellow, American Institute of Aeronautics & Astronautics
AIAA Aerodynamics Award

Current federal posts: NASA Advisory Council Aeronautics Committee

Hobbies: Skiing, hiking, fly fishing, golf, flying

Mike Bragg arrived as a freshman at the University of Illinois at Urbana-Champaign in 1972 when the aerospace industry was in an epic slump, just one year after the Boeing bust spawned the iconic "Will the last person leaving Seattle – Turn out the lights" billboard.

But he loved airplanes, enough to earn his pilot's license days after he turned 17. He grew up on a Central Illinois farm with a grass runway. His entire extended family flew planes, for transportation or income or fun. So he chose to study aerospace engineering, against all evidence that he might never see a paycheck.

Bragg, who began his new job as the dean of the University of Washington's College of Engineering in July, tells this story to illustrate a point. By the time he graduated, the industry was recovering, and he has been gainfully employed ever since.

"It's what I really wanted to do, so I went ahead and did it. Like a lot of things, engineering students have to follow their passions. It's hard work being an engineering student. Certainly, I think there are enormous benefits and payoffs that make it worth it. But you have to love it," Bragg said.

Bragg taught aerodynamics and flight mechanics at The Ohio State University and the University of Illinois at Urbana-Champaign, authoring more than 200 research papers and mentoring more than 50 graduate students. Though his research has taken him into hypersonics, engine work, wind turbines, sonic boom mitigation, and other fields, he has nationally recognized and sought-after expertise in airplane icing and unsteady aerodynamics.

Since 1999, he has held numerous leadership posts in the top-5 ranked College of Engineering at the University of Illinois at Urbana-Champaign, including interim dean, executive associate dean for academic affairs, associate dean for research and administrative affairs, and head of the aerospace engineering department.

The Trend recently sat down with Dean Bragg for a conversation about his background, his career highlights so far, and his move to the Northwest.

After many years teaching and conducting research, what drew you to administration?

I think you do it for the same reasons that faculty do research, because you want to have an impact. As an administrator you do that in a different way, by providing resources and facilitating so faculty and students can be successful.

Being in a college at any major research university you also begin to have a broader view of engineering. There are different cultures, differences in the ways aerospace engineers do things versus civil engineers or computer scientists. I really enjoyed learning about all that and taking the best ideas to help improve the college.

What are some personal career highlights?

I'm proud of the fact that my students and I have done a lot of things to make air travel safer. You're always proud of your graduate students, who are sort of like your children too, and all the wonderful things they do. I'm proud of the people I hired. And at the college level, we really changed the culture from every department looking out for itself to people thinking more of the college as a whole.

You have deep roots in Illinois, why move to the Northwest?

I'm an aerospace engineer. It's always been special for me to fly into SeaTac and drive by Boeing Field, usually on my way to Boeing. A good friend of mine who was head of the aero department at MIT used to say, "When I'm looking to hire faculty members, if an airplane flies over and they don't look up, I know they're not right for the department." I always look up. The UW has a world-class college and university here, and the connection not only to aerospace but also to the other high-tech industries here is really special and a draw for me.

What opportunities at the UW really excite you?

When I started college in the '70s and began studying engineering, I was just fascinated by technology and cool gizmos. Today, our students want to change the world. They want to figure out how to get clean water in Africa, or produce low-cost artificial limbs. They really come to engineering because they want to help create solutions so people can live better – and that all gets to impact.

One way you have impact is to move things out to industry. It's so much more important for engineering students, faculty, and colleges to not only do their research but also to connect with industry, to spin out companies, to really get engaged. There is such a wonderful high-tech community here in the Northwest. It's not just aerospace; it's software, medical devices. That was a major driver for me.

There's a very good startup culture at the University of Illinois, but it's in a small community. When things really get going, someone buys it and the company moves to Silicon Valley or someplace else. That doesn't have to happen here.

What are the challenges?

There are lots of very highly qualified students who aren't able to earn engineering degrees at the UW because there just isn't enough capacity. So we have a College of Engineering that needs to be significantly larger than it is.

The challenges have been budget-driven, and we have facilities that are stretched to the limit.

So how do you grow facilities and capabilities and infrastructure in what is still a very resource- limited environment? It's going to depend upon the high-tech sector here, alumni and friends, and on the state as well.

What role can alumni play?

Alumni are so important. It's amazing what percentage of UW Engineering graduates are still in this area. That's a big difference from where I came from. It's great for them because they can stay connected, and it's great for our students who can benefit from their mentoring, support, insight, and connections.

WASHINGTON STARS IN ENGINEERING

New 'Academic Redshirt' Program Gives Students an Extra Year to Pursue Engineering

By M. Sharon Baker

When Eastern Washington resident Yuriana Garcia was a freshman two years ago, she and her peers struggled with general chemistry and calculus classes that were part of the pre-engineering course requirements.

"We hit a wall," she said. "Going through the pre-engineering curriculum was especially challenging for me."

She watched as many of her peers gave up on their dreams of becoming engineers while only a few like her "got up and tried again and again until we were accepted into our desired majors," she said.

When Garcia heard about a new program to give extra support to pre-engineers starting this fall, she jumped at the chance to be a student mentor.

Similar to the redshirt programs commonly used to extend students' athletic eligibility, the University of Washington and Washington State University are starting engineering "academic redshirt" programs to help level the playing field for low-income students.

The new program, called the Washington STate Academic RedShirt in Engineering program or STARS, will provide 32 incoming freshmen at each university with extra academic support, mentoring and funding over the course of their first year to help them become successful engineering students. The UW's program also includes a guaranteed spot in one of the competitive engineering departments, provided the students meet certain requirements.

Eve Riskin, associate dean for academic affairs and principal investigator on the grant that created STARS, hopes the program will also change the way the UW evaluates student success and readiness for engineering.

"What I'm most excited about is that this could improve our numbers of low-income and underrepresented students," said Riskin. "It also could bring about a cultural change in how we assess suitability for engineering."

The program is modeled after the University of Colorado's Goldshirt program. The five-year, $970,000 grant funding for the UW comes from Graduate 10K+, a partnership between the National Science Foundation (NSF), Intel and GE, and investment advisor Mark Gallogly. The goal of Graduate 10K+ is to improve retention of undergraduates in engineering and computer science. "We're trying to figure out ways to make engineering more accessible," said Dawn Wiggin Esselstrom, co-principal investigator on the grant and associate director of student academic services at the College of Engineering.

One way to meet the challenge and increase those numbers is with the five-year STARS program."We know that the lowest-income students are coming from the lower-income schools educationally and economically, and those schools aren't preparing students at the same level as others in Washington state," said Esselstrom.

The new program generated a lot of interest, with 80 students applying for the 32 slots at the UW. "I am looking forward to being part of a group with others that share the same interest in engineering as I do," said one incoming STARS freshman. Added STARS student mentor Garcia, who is now studying in the Department of Human Center Design & Engineering, "With the support of a program like STARS, I am positive more underserved, low-income students will graduate from the University of Washington with an engineering degree."

To support the STARS Program contact Joseph Sherman at shermjp@uw.edu

An Uncommon Partnership

Startup Generates Electricity from HVAC Systems Thanks to UW Design, Testing

By M. Sharon Baker

As a Seattle commercial electrician helping biotechnology and other firms earn green building certification, Mark Davis saw an opportunity.

Why couldn't companies capture energy from the air being pumped out of the massive HVAC systems in their data centers or biotech labs and use it to reduce their costs?

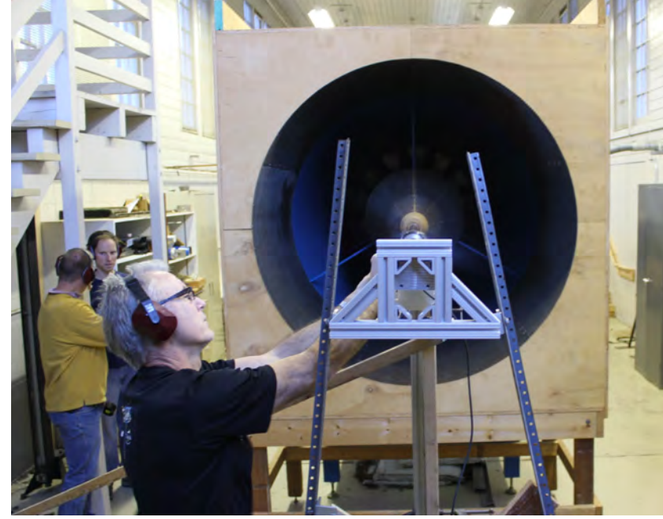
When he couldn't find anyone making a commercial wind turbine to harness exhaust, Davis bought a residential system to see if it would work.

"We learned a lot, most notably that an off-the-shelf unit wasn't going to work," said Michael Kudriavtseff, Davis' partner and a UW alum (BA '04 Business Administration). "We needed something more attuned to specific velocities and different-sized turbines because the (residential) systems were incredibly inefficient."

It was obvious, Kudriavtseff said, that to get their startup Second Wind off the ground, they needed someone to design an efficient turbine for their system. They approached several engineering companies without success, but found a perfect partner when a friend in the aerospace industry suggested they contact the University of Washington.

So began an uncommon partnership about 18 months ago when Kudriavtseff and Second Wind approached the UW.

Initially, Second Wind sponsored research by Alberto Aliseda, an associate professor in the Department of Mechanical Engineering, which resulted in new intellectual property for the turbine that Second Wind is licensing from the UW.



"Typically, professors and students create commercially viable technology and companies are formed and spun out," said Deborah Alterman, technology manager for the Center for Commercialization.

"In this case, a startup had a great idea and expertise but couldn't find a commercial partner, and we are moving forward together," she said. "This wasn't an idea sparked inside the UW, but Aliseda developed a core piece of their system based upon his expertise in turbines."

Turning Exhaust Into Energy

Air handling units account for about 40 percent of the operating costs of biotech and data centers, buildings that require 10 times more electricity per square foot than typical commercial buildings, according to Second Wind.

"Typically, kinetic energy in the building air exhaust is wasted," Aliseda said, "so by placing small turbines (on exhaust fans), we can harness energy without changing the ventilation system or reducing its flow or its ability to expel hot or humid air or exhaust fumes."

"The key is that we have a constant source of wind and don't have to depend on changes in wind speed or direction from natural wind," he said. "The challenge is that most HVAC fan systems are small sections, and we have to recover the energy in a cost effective and efficient way. The difficult tradeoff has been the capital investment and the amount of electricity you produce."

Second Wind will test several units in September, and the company plans to be in full commercial production after testing is completed, said Kudriavtseff. The Redmond-based company, which employs six people, is in discussions with several customers and has lined up manufacturers in the Seattle area to make the units.

"I'm excited not only because we're helping a local company start up, but we're supporting conservation efforts and this is a product the university could use," Alterman said. "We're open to helping other startups and finding new ways to work together."

To learn more, visit www.secondwindenergy.com

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2013 Engineering Lecture Series Engineering Infrastructure: From Failing Grades to Future Systems

Failing Grades to Future Systems

Wednesday, October 23

Paula Hammond, Senior Vice President and National Transportation Market Leader, Parsons Brinckerhoff

Greg Miller, Professor & Chair, Civil & Environmental Engineering

A region's infrastructure is often invisible to us when it's working as it should. But in Washington State, 366 of our bridges have been identified as structurally deficient, 10% of our roads are rated "poor" with many others in decline, and the state received a C-rating overall from the American Society of Civil Engineers. Hear how the infrastructure of today was conceived and built and examine needed policy, funding and innovation to move us into the future.

Spanning the Gap: Lessons in Bridge Engineering

Wednesday, October 30

John Stanton, Professor, Civil & Environmental Engineering

Perhaps more than any other area in the country, Washington State has a history of collapsing bridges. From the infamous Galloping Gertie and the old I-90 to the most recent Skagit bridge collapse, these "unintended field tests" have provided useful lessons for contractors and engineers. As we look to the bridges of the future, what are the major technological breakthroughs that have led to dramatic shifts in design and construction?

Tunneling Toward a New State Route 99 Corridor

Thursday, November 14

Matthew Preedy, PE (BSCE '92) Deputy Program Administrator, Alaskan Way Viaduct Replacement, Washington State Department of Transportation

In summer 2013, Bertha, the world's largest-diameter tunneling machine began a historic journey beneath downtown Seattle to dig a tunnel to replace the SR 99 Alaskan Way Viaduct. The machine's task sounds straightforward, but the story behind it is complicated. It begins with an earthquake that damaged the viaduct and led to a decade of public debate about how to replace the vulnerable structure. More than 90 alternatives were studied and the story's conclusion is unfolding now.

All lectures are at 7pm, Kane Hall, UW Campus – FREE!
Registration required, online at UWalum.com/engineering or call (206) 543-0540.

Presented by the College of Engineering in partnership with UW Alumni Association