

The **TREND** in Engineering

THE UNIVERSITY OF WASHINGTON COLLEGE OF ENGINEERING NEWSLETTER **SPRING 2013**

The William E. Boeing Department of Aeronautics & Astronautics

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WHEN I WAS ASKED to take on the role of interim dean of engineering, I was two weeks away from retiring from a 30-year career as a professor and department chair. I didn't have to think long though before saying "yes" to this opportunity. It's been an honor to lead the college at this exciting time.

UW Engineering continues to play an important role on the national stage. Recently, the *US News & World Report* ranked UW Engineering 14th overall in public university graduate programs, and the bioengineering and computer science and engineering departments were again ranked in the top 10 of both public and private universities.

The college is a recognized national leader in advancing women in engineering and a recent award from the Henry Luce Foundation's Clare Boothe Luce Program will further this important work. The grant, totaling close to half a million dollars, will create two professorships for women in engineering; one in the Molecular Engineering and Sciences Institute and the other in the National Science Foundation Engineering Research Center for Sensorimotor Neural

Engineering, two innovative interdisciplinary research centers.

Along with seven elite engineering schools, we announced our participation in the National Academy of Engineering Grand Challenges Vest International Scholarship program last month. This program will foster international collaboration among graduate students whose studies are focused on tackling some of the world's biggest challenges. The participating universities are all conducting leading research toward addressing the NAE Grand Challenges for Engineering, 14 "game-changing" goals with the potential to dramatically improve life in the 21st century, identified by a blue-ribbon committee of prominent technological thinkers and doers.

The college is a recognized national leader in advancing women in engineering . . .

Our faculty continue to receive top honors and pursue new partnerships to advance research. James Carothers, a new faculty member in chemical engineering, was awarded a prestigious Sloan Fellowship. This award is given to early-career scientists and scholars whose achievements and potential identify them as rising stars.

Regionally, we expanded a partnership with the Pacific Northwest National Laboratory (PNNL) with the creation of the Northwest Institute for Advanced Computing, a joint institute based at the UW that will foster collaborative computing research between the two institutions. This collaboration will create tremendous new opportunities for both organizations as "big data" is transforming the process of discovery in all fields.

The college is in a strong position for a new leader and I'm excited to welcome Mike Bragg as the new dean of engineering this summer. Mike comes to us from the University of Illinois, Urbana-Champaign. He brings a depth of experience as an educator and administrator that promises to be transformative for UW Engineering. I hope you'll join me in welcoming him to the UW.

Judy Ramey
*Interim Frank & Julie Jungers
Dean of Engineering*

Mechanical Engineering Alumna Sally Jewell Confirmed as Secretary of the Interior

Chosen for her passion and background in engineering, the outdoors, and corporate leadership, Sally Jewell (BSME '78) was nominated by President Obama for Secretary of the Interior.



Jewell, now president and CEO of REI and a UW regent, will oversee the stewardship of more than 500 million acres of public lands, from Yellowstone

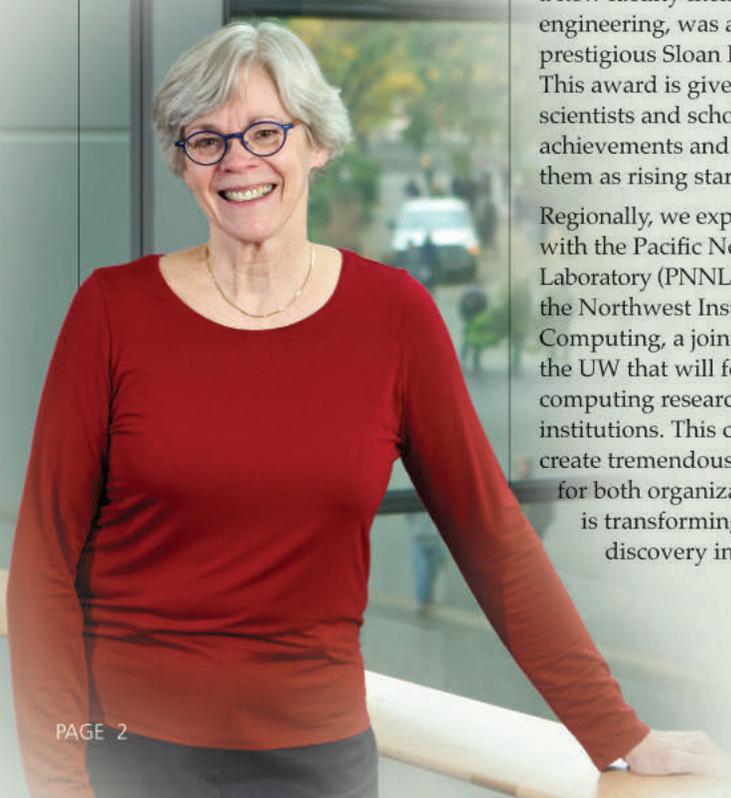
National Park to the Lincoln Memorial.

Devasia assumes College leadership role



Santosh Devasia, professor of mechanical engineering, has been named associate dean of research and graduate studies.

In this role he will foster multidisciplinary collaborations, develop research programs, and strengthen recruitment and mentoring programs for graduate students.



Michael Bragg Selected as New Dean of Engineering

This summer, Michael Bragg will join the college as the Frank & Julie Jungers Dean of Engineering.

An aeronautical engineer by training, Bragg is currently with the University of Illinois at Urbana-Champaign where he has served as professor and interim dean of the College of Engineering. Bragg brings a wealth of experience to the UW. He has held numerous leadership positions at Illinois, including head of the aerospace engineering department, associate dean for research and administrative affairs, and executive associate dean for academic affairs.

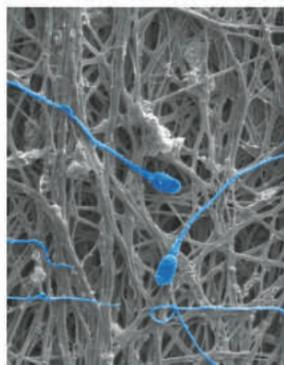


Bragg is an international expert on the effect of ice accretion on aircraft aerodynamics and flight safety. He directed over \$15 million in externally funded research and published more than 200 research papers. A Fellow of the American Institute of Aeronautics and Astronautics, he has received several national awards for his work. More than 50 graduate students and five post-doctoral researchers received their advanced degrees under his guidance.

He has been instrumental in curriculum innovation at Illinois, including supervision of the Technology Entrepreneurial Center and is a co-founder of two faculty startup companies. Additionally, Bragg has grown education programs and championed diversity.

You can learn more about him in the fall issue of *The Trend*. Please join us in welcoming Mike to UW Engineering.

Promising research to prevent unwanted pregnancy & HIV *By Hannah Hickey*



The only way to protect against HIV and unintended pregnancy today is the condom. It's an effective technology, but not always used.

A UW team has developed a versatile platform to simultaneously offer contraception and prevent HIV. Electrically spun cloth with nanometer-sized fibers can dissolve to release drugs, providing a platform for cheap, discrete and reversible protection.

"Our dream is to create a product women can use to protect themselves from unintended pregnancy and HIV, and to deliver it in a way that women want to use it," said lead researcher Kim Woodrow, an assistant professor of bioengineering.

Electrospinning uses an electric field to catapult a charged fluid jet through air to create very fine, nanometer-scale fibers. The fibers can be manipulated to control the material's solubility, strength and even geometry. Because of this versatility, fibers may be better at delivering medicine

than existing technologies such as gels or pills. No high temperatures are involved, so the method is suitable for heat-sensitive molecules. The fabric can also incorporate large molecules, such as proteins and antibodies that are hard to deliver through other methods.

The team first dissolved FDA approved polymers, and antiretroviral drugs used to treat HIV, to create a gooey solution that passes through a syringe. As the stream encounters the electric field it stretches to create thin fibers measuring 100 to several thousand nanometers that whip through the air and eventually stick to a collecting plate. The final material is a stretchy fabric that can physically block sperm or release chemical contraceptives and antivirals. This method allows controlled release of multiple compounds.

One of the fabrics the team made dissolves within minutes, potentially offering users immediate, discrete protection against unwanted pregnancy and sexually transmitted diseases. Another dissolves gradually over a few days, providing an option for sustained delivery, more like the birth-control pill.

The fabric could incorporate many fibers to guard against different sexually transmitted infections, or include more than one anti-HIV drug to protect against drug-resistant strains. Mixed fibers could be designed to release drugs at different times to increase their potency, like the prime-boost method used in vaccines.

The electrospun cloth could be inserted directly in the body or be used as a coating on vaginal rings or other products.

The research team will spend the next year testing combinations that deliver two antiretroviral drugs used to treat HIV and a hormonal contraceptive, and then six months scaling up production of the most promising materials.





THE WILLIAM E. BOEING DEPARTMENT

After nearly a century developing airplanes, through tremendous industry growth and technology advances, some things seem immutable. Boeing leaders are visionaries and risk takers, test pilots are bold, and engineers take pride in designing the best aircraft heading into the skies.

Another immutable is the intertwined history of The Boeing Company and the University of Washington. In 1916, with a first plane barely off the drawing boards, William E. Boeing hired two new engineering graduates, Clairmont Egtvedt and Philip Johnson. Both rose to top management, the first in a line of UW alumni who helped build a global industry.

In 1917 Bill Boeing made a personal gift of \$6,000 to the UW to construct a wind tunnel to test plane models. In return, the university committed to offer aeronautics courses to train engineers for work at his fledgling company. This act of generosity and foresight was the first courtship gesture in a long relationship now honored through the naming of the department.

Our salute to William E. Boeing begins with a bit of local lore. In a headline news event in August 1954, test pilot Tex Johnston put the Dash-80 prototype for the 707 passenger jet into two slow and unauthorized barrel rolls over the Seafair crowd on Lake Washington. Boeing president William Allen asked an industry guest for one of his heart pills, and called Johnston into his office the next day for a stern reprimand.

Bill Boeing's own heart fluttered in June 1916 during testing of the first plane he and a friend designed. The test pilot was late arriving at Lake Union, so

an impatient Boeing hopped into the plane and took it for a brief flight skimming over the water. Over the next few days, under Boeing's orders, the pilot taxied the plane around the lake to test the controls. Tiring of little hops, he gunned the engine, lifted into the sky and flew over the city to Lake Washington. A stunned Bill Boeing rushed to the lake and chastised the pilot: "Don't ever do that again unless I authorize it!" ... followed by "How was it?"

A month later Boeing incorporated the Pacific Aerospace and Manufacturing Company. His son, William E. Boeing, Jr., recalls his father as a visionary who didn't just dream about flying, but early on foresaw the huge potential for commercial aviation and set high standards and goals for his enterprise.

"He knew the hallmark of a good engineer was to never do anything less than perfectly, and also never discount any novel idea, but try it out," Boeing said.

Bill Junior's first flight at age 5 was a buzzing over the family home in one of the rugged Boeing Model 40-series planes that won the 1927 U.S. Postal Service contract to carry mail from Chicago to San Francisco. A small compartment for two people turned it into the company's first plane for paying passengers, in addition to mail. "The Model 40 was the company's foundation for commercial success," said Boeing. "Egtvedt and Johnson did a tremendous job overseeing design and manufacturing; they built 24 planes in only six months, which was an almost impossible feat for that time."

Education and Research Collaboration

UW aeronautics courses began in 1917, taught by civil, mechanical, or electrical engineering faculty members. In 1928 a \$290,000 grant from the Guggenheim Foundation to construct an aeronautics building gave the program a big boost. Bill Boeing exerted influence to help secure the grant and again donated personal funds. The aeronautics department was officially established in July 1929 with four faculty members, and the Daniel J. Guggenheim Aeronautics Hall opened its doors to students in April 1930.

Growth of the department's research and The Boeing Company's need for larger test facilities prompted construction of the Kirsten Wind Tunnel, completed in 1936 with federal and state funding and a loan from the company. Boeing has tested nearly every new design in this wind tunnel, establishing it as a world-class facility, and still uses it to test 767 Air Force tanker designs.

"UW Engineering graduates have played key roles in developing every major model of Boeing passenger jetliners, from the 707 through 787, and others held leadership positions in the defense and aerospace units," said Professor Jim Hermanson, chair of A&A. "Every year about a third of our A&A graduates go to work at Boeing."

Professor Adam Bruckner, department chair from 1998 to 2010, cites several certificate training programs as among the great success stories of the UW-Boeing collaboration. In 2006 Boeing provided a \$500,000 gift to launch the Global Integrated Systems Engineering Program (GISE), which trains industry engineers and UW graduate students to manage complex projects in a global context.

Certificate programs in aircraft composite materials and manufacturing and in structural analysis and design have been jointly sponsored since 2004 by UW Engineering and the Boeing Learning, Training and Development group. More than 1,000 Boeing employees have been trained in evening courses at the Everett plant.

"These composite courses were the first such training programs in the nation. They have been hugely successful and have won national awards from industry and engineering education associations," Bruckner said.

Boeing has long provided scholarships and fellowships to students in engineering and other UW programs, and since 1986, Boeing has funded seven professorships and endowed two chairs in engineering departments.

OF AERONAUTICS & ASTRONAUTICS

By Sandy Marvinney



Boeing also has funneled research funds into the areas of alternative propulsion and composite structures. One prominent example is the Center of Excellence for Advanced Materials in Transport Aircraft Structures, part of a national academic-industry consortium established in 2003 with funding from the FAA.

A "Seal" on the Relationship

Today, more than 9,700 UW alumni work throughout The Boeing Company. Hermanson is already seeing a buzz of excitement about the prestige conveyed by the Boeing name, and the potential to attract top-flight faculty and students. A&A leaders are continuing discussions with upper-level Boeing officials to explore ways to grow research collaborations and education programs and training.

"We are thrilled to carry the name of William E. Boeing, and honor his legacy to our department and to the industry," said Hermanson. "It puts a formal seal on a long, close relationship and empowers the future."

Todd Zarfso (MSEE '90), vice president of engineering for Boeing Commercial Aviation Services, serves as Boeing's executive focal to the UW and on the UW Engineering Visiting Committee. He noted that the company has endowed chairs and professorships at other universities, but only UW A&A bears the name of the founder.

"Bill Boeing was the Bill Gates of his generation and his visionary spirit pervades our company's culture," he said. "His relationship with the UW was special, and the naming reflects both a natural synergy and Boeing's confidence in the university in our back yard. Our mutual goal is to help build a world-class department. It's a triple win — for Boeing, our workforce, and the UW."

A Bridge to Engineering, A Bridge to Achievement

By Sandy Marvinney

Each year as fall quarter starts, most UW freshmen are feeling excited, scared, eager, and overwhelmed. Most probably settle down, but imagine being the first in a family to attend college, or coming from a small high school, or being a student of color and wondering if you will fit in. Worries about being prepared and feeling pressure to succeed add to stress.

For students from disadvantaged and underrepresented groups with hopes to major in one of the STEM (science, technology, engineering, and math) fields, UW Engineering extends a helping hand — one with a long history. Only seven minority students earned engineering degrees in 1981. That's when the college set a goal to bump up those numbers by reaching out to populations underrepresented in STEM. Over the decades, more than 4,000 students have taken advantage of a steadily expanding array of academic support services through what evolved into the Minority Scholars Engineering Program (MSEP).

"Now more than 50 underrepresented minority students are earning undergraduate and graduate degrees in engineering and computer science each year," said Eve Riskin, professor of electrical engineering and associate dean for academic services. "That's progress, but we want these numbers to grow more quickly. The good news is that we give these students the confidence and boost they need to succeed in their engineering courses. Then they go out and do great work and serve as role models for the next generation of students."

One example is alumnus Bill Fishburn (BSAA '93), a senior program manager of a product development team at Intel (photo at right). When growing up in Spokane he was one of just a handful of students of color in his school. He started his engineering studies at the University of Minnesota–Duluth, but the financial burden of out-of-state tuition eventually prompted a transfer.

His immersion into tougher engineering course work at the UW was aided by participation in STEM Bridge, a program that helped incoming first-year and transfer students make a smooth transition to the university.

"Bridge provided a great introduction to the UW and an instant community of science and engineering majors who looked like me," Fishburn said. "I found a group of study partners and tutoring help when I had to retake a linear algebra class in which I earned only a C- at Minnesota."



Like hundreds of students before and following him, he turned to the Engineering Academic Center for coaching to “get over the hump.” After receiving his BSAA, Fishburn earned an MS in mechanical engineering at UC Berkeley.

Bridging the Gap

Today STEM Bridge is run by MSEP and the university’s Louis Stokes Alliance for Minority Participation (LSAMP) program. During Early Fall Start, about 40 students live together in a dorm and take Bridge math courses designed to prepare them for the rigors of university-level work. They also get a peek into STEM professions and a taste of research through hands-on projects in engineering and science labs. They engage with the campus community from day one and learn about resources offered through MSEP, LSAMP and the Office of Minority Affairs and Diversity (OMA&D).

Garfield High School grad Cezanne Camacho (top photo) enrolled in fall 2009 with admission to the UW Honors Program and freshman admission to the EE program. If only smarts, high SAT scores, and a knack for building robots ensured a successful undergraduate experience, the story would end here. But majoring in engineering can be a tough road, even for the best students.

The challenges are magnified for women and students such as Camacho, whose family heritage is half Mexican. In one of her classes this year she was the only woman, and at times she felt pressure (mostly internal) to prove her capability. She has risen above it all and this year is president of Tau Beta Pi, the engineering honor society.

“The Engineering Bridge program was huge for me,” Camacho said. “It gave me a community of peers and a strong network of mentors and advisors.”

The Bridge program can spark passions that powerfully shape an academic and career pathway. That was true for Camacho, who was fascinated with circuitry and thought a career designing robotic prosthetic arms would be her thing. Through Bridge she was connected with EE and CSE Assistant Professor Georg Seelig’s lab, which explores how biological organisms process information and also engineers complex biochemical networks to program cellular behavior.

“Professor Seelig explained that a cell is like a complex circuit and you can program biological signals for therapy applications such as smart drug delivery. His work was more exciting than anything I had conceived of before,” Camacho said.

Through grant and scholarship support, she continued working in Seelig’s lab and was a lab mentor to Bridge students

and sophomores. In 2011 her presentation on a new way to isolate DNA strands from bacteria won a best student presentation award at Caltech’s DNA 17 conference.

“STEM Bridge is a great example of the impact collaborative programs can have on our students,” said Sheila Edwards Lange, UW Vice President/Vice Provost, Minority Affairs and Diversity. “This intensive program exposes them to the academic rigors of college life, while providing critical resources and support. It also aims to foster student enthusiasm in the STEM disciplines.”

Enthusiasm Sparks Mentoring

While undergrads, both Fishburn and Camacho engaged with MSEP-affiliated programs that strengthen support networks. Both valued the experience so much that they are giving back as mentors. At UW, Fishburn served as president of the Society of Hispanic Professional Engineers (SHPE). He returns to campus annually to talk with SHPE students, and he has participated in STEM Bridge Alumni Night, which offers freshmen insights about academic and career options, an exchange Fishburn finds both vitalizing and fun.

As a successful professional he is eager to encourage more young people of minority backgrounds to consider an engineering career. The disparity of underrepresented minorities and women in STEM disciplines is becoming an increasing issue in the US. African-Americans, Latinos, and American Indians make up 34 percent of the population aged 18 to 24, but earn only 12 percent of engineering undergraduate degrees. Women comprise about 46 percent of the US labor force but just 10.8 percent of engineers.

“Every employer should strive for a workforce that reflects population diversity because it is good for business. More perspectives at the table increase the likelihood of innovation and design of a better product,” Fishburn said.

Camacho’s participation in Women in Science and Engineering (WiSE) and PEERs (Promoting Equity in Engineering Relationships) provided added inspiration and encouragement. Among her Student Academic Services mentors she especially singles out EE Professor Riskin.

“I want to be Eve Riskin,” she said with a laugh. “I may become a professor just because I want to be a role model like her.”

Cezanne Camacho will soon cross another bridge. The electrical engineering senior will receive her diploma and embark on doctoral work at Stanford University with a goal to improve drug delivery technologies and targeted treatments for cancer. One bridge leads to another in a world of opportunity.

Interested in MSEP? Consider these opportunities:

Volunteer at the STEM Bridge Alumni Night
Professionals speak with students about their career path to engineering.

Give to the MSEP Fund
This fund contributes to transition and retention programming for underrepresented minority students.
To learn more, contact Joseph Sherman at shermjp@uw.edu



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Friday, May 31, 2013, 6-9 PM
Husky Union Building (HUB), UW Campus

Please join the College of Engineering as we honor these five eminent engineers with 2013 Diamond Awards for their outstanding professional and community achievements.

Paul M. Anderson, '67 BS Mechanical Engineering
Distinguished Achievement in Industry

A leader known for returning struggling corporations to profitability, he led the merger to create Duke Energy and turned around Australia's largest natural resources company BHP Billiton.

Jon Magnusson, '75 BS Civil Engineering
Distinguished Achievement in Industry

Former chairman and CEO of Magnusson Klemencic Associates, an international award-winning structural and civil engineering firm, he has been responsible for the structure of many Seattle landmarks.

Albert Kobayashi, '52 MS Mechanical Engineering
Distinguished Achievement in Academia

A world renowned expert in the fields of fracture mechanics, experimental stress analysis, and finite element analysis; his research has impacted many industries including aerospace, construction, and healthcare.

Tom Rolander, '72 BS Civil Engineering, '76 MS Electrical Engineering
Entrepreneurial Excellence

A pioneer of technologies that shaped the last thirty years including one of the most influential operating systems, CP/M, the first CD-ROM encyclopedia, and software for the data Discman, he continues to create companies that improve our lives through innovation.

Kevin Ross, '88 BS Computer Science
Distinguished Service

The founder of Washington FIRST Robotics, focused on inspiring K-12 students to become science and technology leaders through a team sport involving robotic competitions.

Learn more about the honorees and the dinner at www.engr.uw.edu/da