

CIVIL AND ENVIRONMENTAL ENGINEERING



UNIVERSITY OF WISCONSIN-MADISON

CIVIL DISCOURSE:
PARTNERSHIPS PUSH PROGRESS
IN ETHIOPIA

CHAIR'S MESSAGE



Greetings from Madison!

Fall is always an energizing time of year on the

UW-Madison campus. Thousands of students have returned for the start of another academic year, filling our lecture halls, labs, shops and makerspace. Their enthusiasm is inspiring.

And right now is a particularly exciting time to be leading the Department of Civil and Environmental Engineering.

The university's recently announced \$100 million partnership with Foxconn Technology Group will open up new avenues of research for our faculty, graduate students and undergraduates, including in the areas of autonomous and connected vehicle technology and construction engineering and management. It will also lead to a new interdisciplinary research facility on our engineering campus, a major boon to all of us in the College of Engineering.

We remain one of the most productive departments in the country when it comes to research. A recent National Science Foundation CAREER Award, along with

major grants from the National Science Foundation, Environmental Protection Agency, Federal Highway Administration and National Academy of Sciences, to name a few, keep our faculty at the forefront of innovation.

We also continue to hire ambitious new faculty members, two of whom you can read about in this newsletter: Hannah Blum and Nimish Pujara.

Our one-year accelerated master's programs are growing, helping more engineers add credentials and gain focused knowledge in construction engineering and management, environmental science and engineering, geological engineering, structural engineering, transportation engineering or water resources engineering.

We also take great satisfaction as a department in creating meaningful and relevant experiences for our undergraduate students, such as our senior capstone design course. In June 2018, the National Council of Examiners for Engineering and Surveying selected two of our capstone projects for Engineering Education Awards. Only one other institution also received two awards. By bringing together faculty, adjunct professors who have decades of industry experience and professional engineers who serve as mentors,

our capstone course challenges our students with real projects on behalf of clients—and then gives them the support and guidance to deliver professional-quality solutions.

You can read more about our department's national and international impact in the pages that follow. Stay up to date throughout the year by visiting our website (www.cee.wisc.edu) and following us on Facebook and Twitter (@UWMadisonCEE for both).

ON, WISCONSIN!

David A. Noyce, PhD, P.E., FASCE

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**ENGINEERING
FORWARD**

PRODUCTIVE PARTNERSHIP

UW-Madison Chancellor Rebecca Blank (center) and College of Engineering Dean Ian Robertson (second from right) give Foxconn Technology Group representatives, including Chairman Terry Gou (right), a tour of the engineering campus in August 2018. Foxconn's \$100 million investment in UW-Madison includes funding to help establish a new interdisciplinary research facility for the College of Engineering. *Photo: Bryce Richter.*

MORE: www.engr.wisc.edu/100-million-foxconn-gift-launches-major-new-partnership-uw-madison/



BUILDING A LEGACY: ALUMNUS MAKES 'GAME-CHANGING' ESTATE GIFT

Vern Voigt's (BS '74) father, a World War II veteran, attended the UW Farm Short Course. His mother finished grade school.

While Oliver and Lone Voigt overcame their limited formal educations through hard work to carve out a relatively comfortable life, they envisioned a different path for their descendants. So every time a grandchild or great grandchild arrived, they set up a 529 investment plan to pay for their college education. Oliver also led by example, reinventing himself after retiring as an artificial inseminator by taking classes through H&R Block, then starting his own tax firm, getting his investment broker's license, taking accounting classes and, at age 81, passing the Wisconsin exam to sell life insurance.

"They were able to make do, but they saw that education was your step into a better life," Vern Voigt says. "My dad was always trying to make sure that everybody had an education."

"Truly game-changing and transformative."

— Chair David Noyce, about the gift

More than 40 years after earning his own degree, Vern Voigt is passing on his parents' ideals. Voigt, who enjoyed a long career as a structural engineer, and his wife, Robin, recently committed a significant estate gift to the department. It is the largest single gift CEE has ever received.

"We just decided it would be good that we leave a legacy behind, and where's the best place to do that? Educating more people and giving them life-changing tools," Vern says.

Vern and Robin's latest contribution will bolster two of their existing scholarship funds, support initiatives around innovation, and create two new funds for faculty: the Vernon V. and Robin D. Voigt Professorship in Civil and Environmental Engineering, which will support an experienced scholar, and the Vernon V. and Robin D. Voigt Assistant Professorship in Civil and Environmental Engineering, which will help attract young faculty.



One of their existing scholarship funds helps draw undergraduate students from underrepresented groups.

"Hopefully our legacy will allow the next generation of engineers to fulfill their dreams," says Vern.

MORE: www.engr.wisc.edu/building-legacy-civil-engineering-alumnus-makes-game-changing-estate-gift/

SCHAUER AMONG 2018 U.S. SCIENCE ENVOYS



James Schauer, the Peterson-Radar-Hawnn Professor, is an international expert on air quality. Now, he has a new platform to share his

work on a global scale.

The U.S. Department of State named Schauer a 2018 U.S. science envoy in June 2018.

Science envoys engage internationally at the citizen and government levels to enhance relationships between other nations and the United States, develop partnerships and improve collaboration. They leverage their international leadership, influence and expertise in priority countries to advance solutions to

shared science and technology challenges. Science envoys travel as private citizens and help inform the Department of State, a variety of U.S. government agencies and the scientific community about opportunities for science and technology cooperation.

Since 2010, there have been 18 U.S. science envoys. Schauer is one of five 2018 science envoys. As a science envoy for air quality, he will highlight American scientific strategies and technologies for mitigating poor air quality, with a focus on South Asia.

Schauer is also the director of the Wisconsin State Laboratory of Hygiene, which in July 2018 took over as the new Central Analytical Laboratory and Program Office for the National Atmospheric Deposition Program.

The program serves public and environmental health, science, education and agriculture by monitoring North America's precipitation and atmosphere for a range of chemicals and uses that data to determine both time and space trends for concentration and deposition.

"It is the international gold standard for long-term, high-quality air pollutant monitoring and has been in operation for 40 years," says Schauer. "The program aligns quite well with both the hygiene laboratory's mission as well as the Wisconsin Idea."

BUILDING BRIDGES BETWEEN MADISON AND ETHIOPIA



To cross the Blue Nile River in Bahir Dar, Ethiopia, there's only one option, short of braving the dark waters below. An aging, narrow bridge serves all types of travelers: cars, bikes, mopeds, rickshaws, pedestrians, even livestock.



The existing, outdated bridge in Bahir Dar, Ethiopia. *Photo courtesy Yimer Degu Ayicheh.*



A street clogged with Bajaj rickshaws in Bahir Dar, Ethiopia. *Photo courtesy UW-Madison Global Health Institute.*



Adjunct Professor Rahel Desalegne, Professor David Noyce, Bahir Dar University researcher Yimer Degu Ayicheh and Bahir Dar mayor Ayenew Belay meet in Madison. *Photo courtesy Rahel Desalegne.*

And, as you might expect, that kind of competition for two lanes can quickly—and routinely—bring traffic to a standstill.

“It has lived its life,” says Rahel Desalegne, an adjunct professor and native of Ethiopia. “There are a lot of safety issues and it doesn’t serve the capacity.”

Desalegne is part of a UW-Madison team that’s lending expertise as advisors on the design of a new bridge that will accommodate—and encourage—multiple modes of transportation in the city of more than 600,000. It’s one of several projects the department has undertaken in recent years in the East African country and part of a global mentality: CEE faculty currently have ongoing research work on five of the world’s seven continents, improving infrastructure and examining environmental issues.

“It’s important for us as a leading university to really try to make an impact around the world,” says department chair David Noyce, the Dr. Arthur F. Hawann Professor. “Our faculty think that way as well.”

Noyce is part of the group adding insight to the new bridge project in Bahir Dar, a regional capital city set on a large lake and home to a large university. Those similarities to Madison have made UW-Madison a natural partner for creating a bicycling plan for Bahir Dar. And while working with Jonathan Patz, director of the Global Health Institute at UW-Madison, on strategies for bike lanes, Desalegne and Noyce learned about plans for a new bridge.

Desalegne and Patz have met with the Ethiopian Roads Authority on multiple occasions to advocate for a design that serves more than just automobiles. The good news: The current plans, which are in the early stages of design, call for two vehicular lanes, two bike lanes and a pedestrian lane in each direction. Noyce, Desalegne and faculty from Bahir Dar University are also pushing to add sensors to the bridge that will allow researchers and students at both universities to monitor its structural health in the future.

Meanwhile, near the border with Sudan to the west sits the hulking—but yet to be completed—Grand Ethiopian Renaissance Dam, one focus of Assistant Professor Paul Block’s work since construction began in 2011.

Block, who’s been working on projects involving the Nile River Basin since the early 2000s, addresses how policies and strategies regarding dam management may affect water availability and energy generation—not just in Ethiopia, but downstream in Sudan and Egypt as well. It’s a tense, layered political situation.

“We hope to have a voice in the conversation,” says Block, who uses forecasts for upcoming seasons to predict climate impacts on water resources in the region. “My desire is to see positive outcomes across the basin. And if there are ways that we can contribute to that—and more than likely small ways, but maybe some important ways—I’m all for it.”

Block is also working on a two-year project funded through the UW2020 initiative with extensions to Ethiopia. His team is creating an early warning system that could alert disaster relief organizations months in advance of potential floods—not only addressing preparedness but also health, social and financial outcomes.

“We talk about the Wisconsin Idea. The people of Wisconsin are also global citizens,” Block says. “I don’t think you have to take too many steps to see how we are all connected in some sense.”

FOCUS ON NEW FACULTY:

PUJARA GOES WITH THE FLOW

A wave crashes into the coastline, driving water onto the shore and then stealing away sand, soil, rocks and more.

For Assistant Professor Nimish Pujara, investigating the fundamental processes behind such an event can lead to bigger-picture lessons that could inform how we develop, manage and protect coastal areas.

"If you understand how much sand is picked up or how much flow is driven onto the land when a wave crashes at a beach, then you can understand how it might change with different conditions and if you build something there, what sort of impacts it would likely have," he says. "And you can then try to develop a bigger picture of how the system behaves."

Pujara, who joined the department in August 2018, studies fluid mechanics in environmental contexts and how turbulent

flows behave in the natural world. By using long, narrow wave tanks to simulate natural events, he can generate wave pulses and then measure metrics like flow speed, depth, friction and pressure. As a PhD student at Cornell University, Pujara helped develop a sensor to measure friction levels throughout such a flow as part of a project to better understand erosion caused by waves.

At UW-Madison, he's reviving a laboratory with a dormant wave tank in the Water Science and Engineering Laboratory on the shore of Lake Mendota, a short walk from the Memorial Union Terrace.

"In my experience, in a well-designed laboratory experiment, there's always something new for you to learn that you didn't know," he says.



In his doctoral work, Pujara drew heavily on theories that were presented at a seminar on the UW-Madison campus in 1971. Little did he know he too would wind up in Madison, after spending three years as a lecturer and postdoctoral researcher at the University of California, Berkeley.

MORE: www.engr.wisc.edu/focus-new-faculty-pujara-goes-flow/



Hannah Blum was attending a recent event on the UW-Madison campus when a worker stopped by to pick up her plate. "Thanks, mate," said the assistant professor.

Cue a few quizzical looks from those around her.

Blum joined the College of Engineering faculty in August 2018 after spending the previous six years in Australia, first traveling there as a visiting researcher, then earning her PhD and finally working as an associate lecturer at the University of Sydney. And she's admittedly still readjusting to life without regular tea breaks, laughing kookaburras and Aussie slang.

FOCUS ON NEW FACULTY:

BLUM COMES FROM THE LAND DOWN UNDER

"Sometimes I feel like an outsider in my own country," she says.

Blum brings more than a unique educational background to CEE, though. She adds expertise in steel structures, with a particular focus on cold-formed steel—steel that, as its name suggests, doesn't require heat during the rolling or pressing process.

Cold-formed steel is lightweight yet still strong, meaning less material is needed to build a structure. It's also easier—and cheaper—to transport.

"It's very strong compared to its weight," says Blum, the Alain H. Peyrot Fellow in Structural Engineering. "Hot-rolled steel, it's thick and chunky. This stuff, it's thin sheets—it's just a couple millimeters thick."

Builders and engineers use cold-formed steel in the main framing for low- and mid-rise structures. For her PhD work—a project

with funding from the Australian Research Council, the National Science Foundation's counterpart down under—Blum analyzed the material's performance in longer spans as part of warehouse or shed frames.

At UW-Madison, Blum will turn her attention to the high-strength variations of both cold-formed and hot-rolled steel. She plans to test the strength against current design codes, which preliminary research has shown to be inaccurate. One challenge has already emerged: securing samples amid current global trade dynamics in the steel industry.

She says she's looking forward to working in the renovated and expanded Jun and Sandra Lee Wisconsin Structures and Materials Testing Laboratory once it's completed.

MORE: www.engr.wisc.edu/focus-new-faculty-blum-comes-land/

GUGEL'S DRIVE TAKES HIM TO TOP OF ENERGY-TECH LEADER



John Gugel joined Honeywell UOP shortly after earning his master's degree in civil engineering from UW-Madison in 1992. The company named him president in June 2018. Photo: Bob Wiedmeyer.

John Gugel (BS '90, MS '92) grew up a few doors down from St. Mary's Hospital on Madison's near south side, a little over a mile from Engineering Hall.

His grade school (St. James Catholic School) and high school (Madison West) were both short jaunts from the UW-Madison campus. When it came time for college, he earned his degree from his hometown university.

But, while he had loved learning from the likes of professors Chuck Salmon and C.K. Wang, he was fairly certain of one thing as he started to consider graduate school.

"I had no intention of going to Wisconsin," he says.

Yet that's exactly where he wound up—an about-face that accelerated a career that has seen him climb the ranks at oil and gas technology firm Honeywell UOP over a more than 25-year tenure. UOP, which has been part of Fortune 100 giant Honeywell since 2005, named Gugel its president in June 2018.

Honeywell UOP, founded as UOP in 1914, develops and licenses technology, processes and equipment for petroleum refineries as well as natural gas processors and petrochemical manufacturers around the world.

The company's list of innovations includes introducing catalysis to refining and inventing high-octane aviation gasoline used in Allied planes in World War II, unleaded gasoline, the catalytic converter, biodegradable detergents, and renewable fuels.

"Honestly, I think it could possibly win an argument to be one of the most impactful companies on people's everyday lives that they've never heard of," says Gugel. "When I talk about what we really do, to try to put it in terms people can relate to, I use an analogy to think of us as the Microsoft of the oil industry. We invent technology that our customers use to convert natural resources like oil and gas into products that consumers actually purchase: things like gasoline, diesel, jet fuel and chemicals."

As a structural engineer, Gugel would seem to be an unlikely candidate to lead a major player in the global energy industry. But after graduating from UW-Madison with his bachelor's degree, he took a job in Amoco Chemical Company's capital projects group.

"I was really intrigued by the industry," he says, "but I was a civil engineer working at a chemical company, so I decided I needed to reinforce my skills."

He sent out applications to schools such as Michigan, Cornell and Stanford—until an answering machine message and a subsequent Saturday morning meeting on campus with a young assistant professor, Jeff Russell, convinced Gugel to reconsider his alma mater.

Russell was in the early stages of building the nascent Construction Engineering and Management Program.

"He was persuasive and energetic," recalls Gugel. "I went back, and I am so glad I did."

In just over a year, Gugel finished his master's coursework, defended his thesis and worked with Russell on a series of published papers around the topic of constructability, a project management approach to optimizing new builds.

"John is one of the most competitive and driven people I know," Russell says. "He helped get us on the map for significant construction research."

MORE: www.engr.wisc.edu/gugels-drive-takes-top-energy-technology-leader/

Catching up with Jeff Russell



There are stacks of papers—orderly stacks, but stacks nonetheless—covering Professor Jeff Russell's desk.

And the top of a bookshelf. And a table. Throw in the dumbbells sitting on the floor, and it becomes apparent that the vice provost for lifelong learning and dean of the Division of Continuing Studies likes to stay busy.

Which might explain why, in addition to leading a major campus unit, he still guest lectures in CEE, teaches in the Master of Engineering in Engineering Management Program, serves on doctoral committees, and helps conduct construction research. Oh, and he recently volunteered to co-chair a campus fund-raising campaign.

"I've kept my hand in teaching and on committees and on a few research projects, because I really enjoy staying intellectually active and engaged with students," says Russell, who's in his 30th year on campus. "If somebody would tell me I can't do any of that, it would make it very difficult for me. I don't want to be a full-time administrator, because then I think you lose touch with the core mission of what we're about: student development, learning, discovery, those kinds of things."

Russell, who took over as dean of the Division of Continuing Studies in 2011, remains interested and involved in the construction industry. In recent years, he's assisted Awad Hanna, the Boldt Company Professor in Construction and Engineering Management, with research projects on how to sequence work and construction readiness.

But Russell no longer has direct advisees—even his schedule has its limits—and he says he misses interacting as extensively with students.

"There's more work and opportunities than I think I've got time for," he says, "and I feel energized and passionate about what I'm doing."

MORE: www.engr.wisc.edu/catching-jeff-russell/

2018 ENGINEERS' DAY AWARD RECIPIENT

Honoring a leader in construction law

The department honored Brian Mullins (BS '77, JD '80), who died of cancer at age 62 in February 2018, with a posthumous Distinguished Achievement Award as part of the college's 2018 Engineers' Day celebration.

Mullins was an accomplished construction lawyer. A partner at Axley Brynelson, he co-founded the firm's construction law group, as well as the construction and public contract law section of the State Bar of Wisconsin. Mullins' peers voted him Construction Lawyer of the Year six times in the past seven years. He also taught CEE's legal aspects of engineering course.

The college presented Mullins' wife, Pam, and children, Brian Mullins and Ashley Kressin, with his award during the Engineers' Day banquet in October at the Discovery Building on campus.

Read a Q&A with Brian's wife and sister: www.engr.wisc.edu/brian-mullins-2018-distinguished-achievement-award-recipient/



CAPSTONE COURSE EARNS NATIONAL AWARDS

The National Council of Examiners for Engineering and Surveying selected CEE for two 2018 Engineering Education Awards, in recognition of two recent undergraduate senior capstone design projects:

- **Law Park Revitalization** (spring 2017): students Kyle Williams, Miles Tryon-Petith, Erik Silvis and Muhammad Alqahtani (all BS '17) collaborated with Madison city officials and the Clean Lakes Alliance to create a new design for Law Park on the western shore of Lake Monona.
- **Interlake Lock and Boat Transfer** (fall 2017): students Madeline Haut, John Dvorak, Erik Elliot, Keegan McDonald (all BS '17) and Christopher Knitter (BS '18) worked with external partners to design a new lock and boat transfer between Lake Michigan and a nearby lake.

Professor Greg Harrington, Adjunct Professor Mark Oleinik and Professor of Practice Charlie Quagliana taught the class that worked on the Law Park project, while Adjunct Professor Fred Klancnik and engineer Bill Wuellner mentored the students. Harrington and Quagliana led the group that took on the lock and boat transfer project and engineers Bill McWilliams and Matt McCord served as mentors.

Four other institutions also won \$10,000 awards. North Carolina State University landed the \$25,000 grand prize.

DEPARTMENT NEWS



Professor Awad Hanna (middle) at his NAC induction, with incoming NAC president Tom Sorley (left) and 2018 NAC president Hugh Rice (right).

The National Academy of Construction elected **Awad Hanna**, the Boldt Company Professor and chair of the Construction Engineering and Management Program, to its 2018 class. The academy, established in 1999, is an organization of industry leaders who have made outstanding contributions over a career to the design, construction and engineering industries. Membership is extremely competitive.

Hanna is also co-leading a \$99,813 Boldt-sponsored project called augmented reality-enabled smart project production system.



Vilas Distinguished Achievement Professor **Katherine (Trina) McMahon** was one of two grand prize recipients of the International Society for Microbial Ecology/International Water Association Bio Cluster Award. The award rewards interdisciplinary research of unusual merit in this field.



Vilas Distinguished Achievement Professor **Bin Ran** received the Wilbur S. Smith Distinguished Transportation Educator Award from the Institute of Transportation Engineers. Alumnus **Ken Voigt** (BS '66) received the organization's Burton W. Marsh Award for Distinguished Service.



Professor Emeritus **Tuncer Edil** won the Award of Merit from global standards organization ASTM International. The award, established in 1949 and the organization's highest recognition for individual contributions to developing standards, carries with it the title of fellow.



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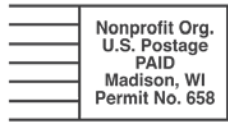
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HELPING YOUNG WOMEN EXPLORE ENGINEERING

A group of geological engineering students came across an article in *Science* that discussed how young children view intelligence in relation to gender—specifically how girls tend to increasingly view men as smarter than women as they get older.

They used a 2017-18 Wisconsin Idea Fellowship to change that narrative

among local middle school girls. Undergraduates Morgan Sanger and Renee Olley, with support from classmate Tyler Klink, created Eva the Engineer, an outreach curriculum for girls at Badger Rock Middle School in south Madison.

"If you don't see role models like you in the job you aspire to have when you are young, you will assume that job isn't for you," Olley says.

The students partnered with the Wisconsin Concrete Pavement Association and the Madison Metropolitan School District to help sixth- through eighth-grade girls explore the field of engineering before the time comes to sign up for high school courses. They've continued the project in fall 2018.

Eva the Engineer approaches engineering through a sustainability



Morgan Sanger speaks to students. Submitted photo.



The students take a field trip to Nine Springs Water Treatment Facility. Submitted photo.

lens by incorporating hands-on activities that challenge the girls to use recycled materials in new and creative ways. Many of the activities involve working with concrete, including making stepping stones out of recycled materials. Women in engineering—both students and professionals—have visited classes and participated in forums to answer questions about their careers.