

CIVIL AND ENVIRONMENTAL ENGINEERING

SOLAR HOUSE SHINES IN COMPETITION



House by Northwestern's solar house features self-cleaning windows and walls that break down air pollutants.

Engineering students play pivotal role in Northwestern's entry into Solar Decathlon

People might expect a solar house to be futuristic and sterile, but the student-built

House by Northwestern was thoughtfully designed to be warm and inviting.

That attention to detail resulted in a strong showing in the US Department of Energy's Solar Decathlon in October, a competition that showcases innovative solar-powered houses designed, built, and operated by collegiate teams from around the world. Northwestern placed sixth overall, and earned first place honors in the Decathlon's Market Potential Contest and Communications Contest, and third place in the Engineering Contest.

Called "Enable," the house was Northwestern's first-ever entry into the Solar Decathlon, and featured the work of multiple undergraduate students from the Department of Civil and Environmental Engineering.

As House by Northwestern's project manager, senior **William Bach** oversaw the design and three-month construction of the house on campus, as well as the transportation of the solar house to Denver, where it was reassembled for the competition. He also helped design the house's thermal envelope, mechanical and electrical systems, architectural plan, and structural system.

"There is no other project that would have provided me with the experience of working with industry partners in the field as well as with skilled trades at the construction site," said Bach, a civil engineering major.

Measured contest captain **Sophie Sisson** was responsible for ensuring that Enable's key sustainability measures — temperature, carbon emissions, and energy production and consumption — were maintained throughout the competition. In addition, she worked with teammates to present to judges the house's ability to complete functional tasks, such as cleaning laundry, charging an electric vehicle, and letting guests cook and host a dinner party.

"House by Northwestern was uncharted territory for us," said Sisson, a senior studying civil engineering. "We had big responsibilities and real deadlines that you don't receive in traditional internships."

In addition to Bach and Sisson, the team included several other department students: **Allison Mark**, **Karia Lopez**, **Alex Toporek**, **Andrew Crane**, **Kathryn Eckhoff**, **Yue Zeng** ('17), and **Gordon Kucan** ('17).

The House by Northwestern team designed Enable for people ages 55 to 70 who lack options for homes where they

Continued on page 3

Dear friends and colleagues,

As you see from reading the pages of our winter newsletter, 2017 was a busy and profitable year for the faculty, students, and alumni of the Department of Civil and Environmental Engineering (CEE). We are making big strides in renewing our faculty, curricula, and space, and our research continues to make an impact improving lives locally and globally. Let me highlight just a few of the exciting events that took place over the last year.

Professor **Yonggang Huang**, whose expertise in the mechanics of materials has led to major advancements in stretchable and flexible electronics, was elected to the National Academy of Engineering in February 2017 (page 9). Huang's work is an excellent illustration of how traditional civil engineering tools can be applied to non-traditional materials such as wearable electronic devices for health monitoring, laying the foundation for innovative applications beyond conventional civil engineering practice.

We also report on two of our faculty whose work in transportation is making important contributions to communities. Professor **Hani Mahmassani**, director of the Northwestern University Transportation Center (NUTC), led a study of Chicago's red-light camera program and found that serious accidents were decreased at intersections with cameras (page 3). Professor **Amanda Stathopoulos**, a transportation economist who studies how individuals and communities adapt to innovation, is currently investigating how mobility-on-demand systems, such as the Divvy bike-share system, are put to use in diverse neighborhoods

and if differences in use patterns can be identified based on income, ethnicity, and gender (page 4). The results of both Mahmassani and Stathopoulos's work provide critical guidance to city planners and policy makers.

The Northwestern Center for Water Research, under the direction of Professor **Aaron Packman**, continues to grow in its mission to tackle the world's water challenges by establishing a new global partnership with Tel Aviv University and Ben-Gurion University in Israel (page 5). Professor **Gianluca Cusatis** is launching a new initiative on large-scale 3D printing, which is poised to transform the world of civil engineering materials, design, and construction; he conducted a fascinating workshop to explore the frontiers of this emerging field (page 6).

Speaking of design, we are exceedingly proud of the accomplishments of our students in the Architectural Engineering and Design (AE&D) program. A number of AE&D students and other CEE students played leading roles in Northwestern's first ever entry to the US Department of Energy Solar Decathlon. Undergraduate William Bach oversaw the design and construction of the solar house, which placed sixth overall in the international competition in Denver, Colorado. Professor **David Corr** and adjunct lecturer **Scott Cyphers** took a group of students to the University of Stuttgart again, further establishing our partnership with the Institute for Lightweight Structures and Conceptual Design (ILEK) (page 7). We are also extremely pleased with the Thornton Tomasetti team, led by **Joe Burns**, who leapt at the task of teaching a new course called

High Performance Buildings during fall 2017 (page 8). Our students and faculty are very lucky to be learning the latest in sustainable urban design from the luminaries of the field at both Thornton Tomasetti and Perkins + Will.

Over the last year, three new faculty have joined our department—Professors **Erica Hartmann** (environmental microbiology), **James Hambleton** (geotechnical engineering), and **Ange-Therese Akono** (structural materials and mechanics). With their arrival comes new research directions, laboratory facilities, and innovative courses. We are also exceedingly pleased to announce that Professor **Giuseppe Buscarnera** was tenured and promoted to associate professor and that Professor **Yu (Marco) Nie** was promoted to full professor. It is wonderful to witness the blossoming of highly successful careers of our young professors.

Enjoy reading about the impressive accomplishments of our students and faculty. We are confident that 2018 will unfold with continued growth and prosperity for our department and hopefully for all of you, as well. We thank our alumni, students, faculty, staff, and friends for their support and commitment to our department. We look forward to continuing to work with you to solve some of the world's most pressing problems and make the world a better place for everyone.



Kimberly Gray

Kay Davis Professor and Chair of Civil and Environmental Engineering

***Kimberly Gray**, Kay Davis Professor of civil and environmental engineering, became department chair in 2015. With a courtesy appointment in the Department of Chemical and Biological Engineering, Gray is an expert in environmental catalysis and physicochemical processes in natural and engineered environmental systems. Her research focuses on energy and urban sustainability applications. As chair, she aims to further the department's work addressing many of the world's most pressing problems, including infrastructure, urban redevelopment, transportation, energy, and water.*

Chicago's Red-light Camera Program Shows Significant Safety Benefits

The study is the first to document 'spillover effect' to intersections without red-light cameras

A study by the Northwestern University Transportation Center released in March found that Chicago's red-light camera (RLC) program reduces serious injury crashes at intersections where they are placed and also has a measurable "spillover effect" that improves safety at intersections without cameras.

Authorized by the Chicago City Council and commissioned by the Chicago Department of Transportation, the report provides tools and analysis that can help the city identify existing and potential camera locations requiring further attention and notes that enforcing RLC violations occurring within fractions of a second after the light turns red might not provide significant safety benefits.

Hani S. Mahmassani, professor of civil and environmental engineering and director of the Northwestern University Transportation Center, led the study.

His research team was composed of an expert advisory panel of traffic safety experts from across the country, including **Joseph Schofer**, professor of civil and environmental engineering at McCormick.

The report found that injury-producing crashes decreased by about 10 percent because of the camera program; more dangerous angle and/or turn crashes decreased by 19 percent. The study also found less dangerous and less frequent rear-end crashes increased by 14 percent, consistent with data in other cities.

The Northwestern RLC researchers are the first to document that red-light cameras improve behavior at intersections without cameras through a "spillover effect." The researchers estimated the spillover effect by comparing before- and after-crash data at 85 intersections where RLCs were installed in 2008 and 2009 with crash data for 103 intersections that were not equipped with cameras.



Hani Mahmassani

The report presented three key recommendations for the program moving forward: review crash and other data on a routine basis, consider the "dilemma zone" (when the light is turning from yellow to red) in which law-abiding drivers can be caught, and ground the program in clear safety benefits.

Solar house competition, continued



Covering just 994 square feet, Enable has two bedrooms and two bathrooms.

can age-in-place, incorporating elements that support an active lifestyle while meeting accessibility requirements outlined in the Americans with Disabilities Act.

The students also took energy efficiency into account when selecting materials for the house. The kitchen countertops, for example, look like stone but are made from the same type of glass used in smartphone screens — a more durable material that also doesn't require mining. The roof is lined with solar cells that harvest enough energy to power both the entire house and an electric car in the garage.

Following the competition, Enable was sent back and reconstructed in Evanston.

ENABLE EARNED THIRD PLACE IN THE DECATHLON'S ENGINEERING CONTEST

It has since been sold, but will be open to the public for tours.

"The Solar Decathlon is more than a competition," said Sisson. "The real objective is to educate the public and make sustainability accessible in hopes of having a lasting impact on the US housing market. Enable achieves that objective completely, and I feel lucky to have been involved with House by Northwestern."

RESEARCH HIGHLIGHTS

When is New Better: Analyzing the Unexpected Challenges of Changing Mobility Patterns

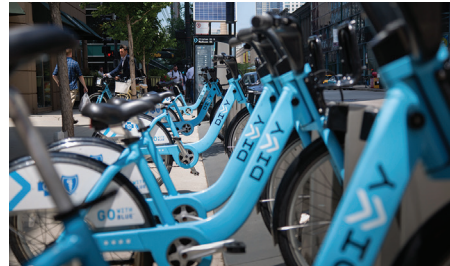
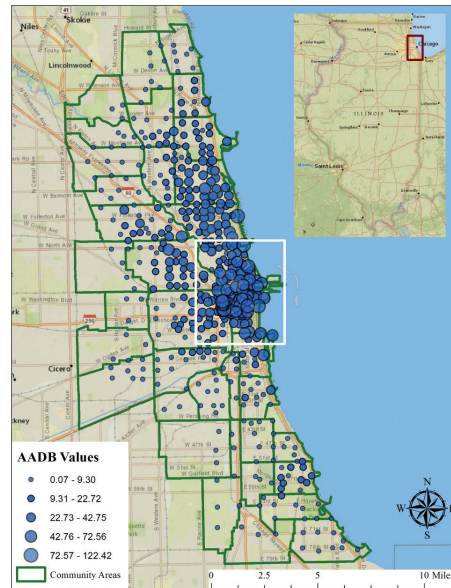


Above: Amanda Stathopoulos; right: plot of average daily bike-sharing pickups in Chicago, revealing strong concentration of activity in center-north areas

Rapid changes in mobility systems are underway in cities around the world, including the introduction of shared mobility solutions, such as Uber, and field testing of increasingly automated vehicles.

These developments present significant opportunities to urban communities, offering prospects of tackling congestion, pollution, and accessibility concerns. At the same time, these changes are disrupting the status quo of current mobility systems and present major behavior and governance challenges.

Current research by Walter Patterson Junior Professor **Amanda Stathopoulos** addresses emerging mobility-on-demand systems where consumers rely on temporary access to mobility services rather than ownership. Despite significant interest in these innovations and increasing usage in cities across the world for mobility of passengers and transportation of goods, several important research questions persist concerning the impacts they have



Stathopoulos studied Chicago's Divvy bike system to learn about the factors that impact mobility patterns.

on existing transportation systems and mobility habits. Stathopoulos's Mobility and Behavior Lab investigates these issues using a variety of analytical tools applied to empirical data, ranging from small-scale qualitative investigations to choice experiments and large-scale spatio-temporal datasets.

Stathopoulos studied the Chicago Divvy system, which makes bike-sharing trajectory data available to the public. Notably, the expansion and evolution of bike-sharing systems is a global phenomenon with strong diffusion in Western Europe, Northern America,

Singapore, and China. In the United States, 28 million bike-share trips were taken across 55 systems in 2016. This diffusion has motivated research to characterize “best practices” for system operations and user impacts. Station-level and community-level models of Chicago bike-share use reveal that sociodemographic factors play an important role. The results provide guidance for planners to consider when defining what constitutes “successful” bike-share systems, which factors to concentrate on to improve the probability of increased use, and how to best leverage the observed divergence in impact for different spatial and social communities, in particular related to income, ethnicity, and gender.

Stathopoulos has further explored Chicago neighborhood perceptions of city-wide mobility programs such as bike-sharing and what community residents think are the local impacts. Using text mining tools like sentiment analysis applied to community discourses derived from focus group transcripts, she hopes to gain insight into the effects of transformative mobility systems. The main contribution of this research is to define how active mobility schemes reap different effects in different types of communities. Such analysis is needed to formulate optimal policies for how cities should design and promote new mobility solutions that serve diverse populations.

There is scarce scientific evidence to support whether mobility-on-demand schemes are enhancing mobility of already privileged groups and whether traditionally underserved populations will be able to reap the full benefits from improving bicycle- and pedestrian-oriented development. Researchers in Stathopoulos's lab are working to acquire and analyze the data that will point the way to greater equity in mobility-on-demand options.

New Grants, Global Partnership Extend Water Center's Reach

Program will support collaborations to solve water challenges

by Roger Anderson

A new global partnership led by the Northwestern Center for Water Research is taking a multifaceted approach to water challenges facing the Middle East.

The research and academic collaboration between Tel Aviv University (TAU) and Ben-Gurion University (BGU) in Israel and Northwestern University further establishes efforts that began shortly after the center's launch in 2016.

"This partnership substantially increases opportunities for Northwestern faculty and students to collaborate with

peers in Israel, and allows us to contribute to solutions faced by the Middle East and other arid regions," said **Aaron Packman**, professor of civil and environmental engineering and director of the Northwestern Center for Water Research.

The Water Center recently initiated a new seed grant program that supports research collaborations to solve these water challenges. The first round of seed grant funding has been awarded to four international groups. **George Wells**, assistant professor of civil and environmental engineering, will work with TAU's Hadas Mamane-Steindel and Dror Avisar to complete a "metagenomics-guided analysis of antibiotic resistance genes in hospital wastewater treatment systems for decentralized water reuse."

"These projects hold the potential to yield scientific discoveries and practical community-centered solutions for water



Aaron Packman

security in Israel and beyond," said Packman. "Water is central to life, and also to industry and agriculture. In a water-poor region like the Middle East, this makes water central to both peace and health for everyone in the region."

Northwestern's Center for Water Research was created in March 2016 to link the University's water research efforts in basic sciences, technology development, law and policy, and systems analysis and simulation to address challenges in water systems sustainability and efficiency.

Student Spotlight: Carolyn Wilke



Carolyn Wilke

WILKE SPENT
10 WEEKS WORKING
AT THE SACRAMENTO
BEE CONDUCTING
INTERVIEWS WITH
RESEARCHERS.

As a PhD candidate in environmental engineering, **Carolyn Wilke** researches the environmental fate of commonly used nanomaterials, specifically silver and titanium dioxide, and their toxicity to bacteria in aquatic ecosystems. Advised by Professors **Kimberly Gray** and **Jean-François Gaillard**, Wilke was recognized with a Northwestern Presidential Fellowship and a AAAS Mass Media Science & Engineering Fellowship in 2017.

As a AAAS Mass Media Fellow, Wilke spent 10 weeks over the summer working as a science writer at *The Sacramento Bee* in California. Conducting interviews with researchers from around the country and racing to finish articles on deadline are not typical responsibilities of a graduate student, but Wilke hopes to do more of these activities in the future.

Throughout her graduate studies, Wilke has been an avid science communicator. She started sharing science stories with the public as a contributor to *HELIX Magazine*, an online publication produced by Northwestern's Science in Society. Wilke believes that clear, creative, and engaging communication about science is crucial, not just for disseminating results to the research community, but to enrich a broader lay audience. After finishing her PhD, she hopes to pursue a career in science journalism.

Workshop Explores Opportunities in Large-Scale 3D Printing

Department hosts 3D printing pioneers to discuss latest advancements in the field

The Department of Civil and Environmental Engineering welcomed 50 members from academia, industry, and government to its first workshop on large-scale 3D printing in April. Called “3D Printing Across Multiple Length Scales: Is The Sky The Limit?,” the event explored how large-scale 3D printing is presenting designers, architects, and engineers with unexplored opportunities to construct large structures with stronger, tougher, more durable, and more environmentally friendly materials.

The workshop featured presentations from 3D-printing pioneers from Stanford, University of Southern California, University of California Berkley, and architecture firm Skidmore, Owings & Merrill LLP that showcased the latest advancements in large-scale 3D-printing techniques and with materials that go beyond metals and plastics.

Michael Case, a project manager in the Army Corps of Engineers’ Construction Engineering Research Laboratory (CERL), discussed his team’s efforts to use large-scale 3D printing to streamline the process of constructing army barracks in warzones and disaster areas. Currently, barracks are made primarily out of wood, which must be transported to territories and manually assembled with a team of workers. Case’s team hopes to develop printing techniques that use local materials — like sand — and large-scale 3D printers to print barracks onsite in 24 hours.

Northwestern Engineering Professor **Gianluca Cusatis**, who is providing computational analysis on CERL’s barracks project, believes scalable 3D printing could add several benefits to building construction.

“3D printing would provide much more control over the quality of the final product since production is automated,” said Cusatis, who organized the workshop. “You would no longer need a construction team. You would only need to ship cement and water to the site.”

Cusatis added that the workshop was an important step in establishing Northwestern as a leader in scalable 3D



Gianluca Cusatis

printing. He hopes the University can one day manage its own large-scale 3D printing lab to further explore the performance of new composite structural materials.

“There is a lot of work to do, but many people from different fields are interested in pushing the boundaries of 3D printing,” said Cusatis. “We have the opportunity at Northwestern to contribute through our research on the mechanics of materials, as well as to educate students using the next generation of 3D printing technology.”

Department Welcomes Ange-Therese Akono

Akono Joins Northwestern from the University of Illinois at Urbana-Champaign



Ange-Therese Akono

Northwestern University is excited to welcome **Ange-Therese Akono** as an assistant professor of civil and environmental engineering.

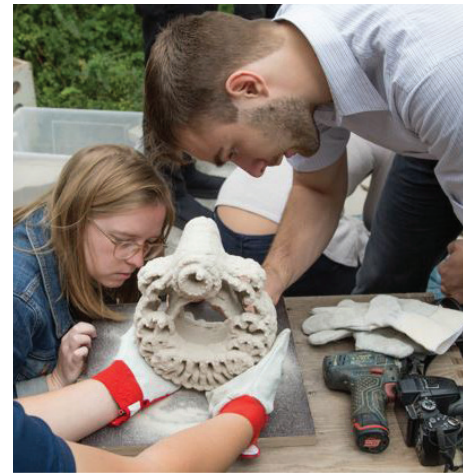
Joining from the University of Illinois at Urbana-Champaign, Akono studies fracture mechanics, experimental nanomechanics, chemo-mechanical coupling, and multi-scale modeling. In her research laboratory, she focuses on understanding fracture resistance mechanisms in composite materials at the nanoscale, with applications in novel structural design, sustainable energy resources, and public health.

“I am thrilled to officially join Northwestern,” said Akono. “I look forward to working with Northwestern students and collaborating with faculty members on cutting-edge issues such as tough and strong cement alternatives, carbon dioxide geological capture and sequestration, and fracture resistance of biological tissues for improved public health.”

Akono received her master’s degree and PhD in civil and environmental engineering from the Massachusetts Institute of Technology and her bachelor’s degree in mechanical engineering from Ecole Polytechnique in Palaiseau, France.

ARCHITECTURE STUDENTS BUILD FORMWORK SKILLS IN STUTTGART

Students took part in a one-week workshop on 3D hydroplotting of concrete formwork to build their skills in conceptual design



Above: Students in the Architectural and Engineering Design program practice 3D hydroplotting of concrete formwork; left: Students build skills in conceptual design and 3D modeling at the University of Stuttgart

Nine Northwestern civil and environmental engineering students, accompanied by Professor **David Corr** and adjunct lecturer **Scott Cyphers**, visited the Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart in September.

The students were part of the Department's Architectural Engineering and Design (AE&D) program that prepares next-generation engineers to combine creative and algorithmic thinking to take on today's sustainability challenges. Northwestern and Stuttgart have alternated visits for the past three years.

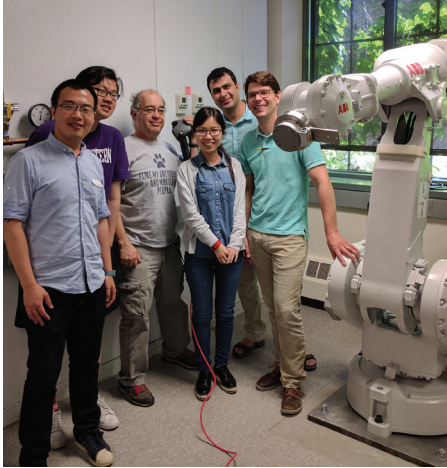
NORTHWESTERN AND STUTTGART HAVE ALTERNATED VISITS FOR THE PAST THREE YEARS.

During their visit, students took part in an intensive, one-week workshop on 3D hydroplotting of concrete formwork to build their skills in conceptual design, 3D modeling, and experimental research while exploring topics like concrete's limits as a building material.

The students used 3D modeling programs to program a Computer Numerical Control (CNC) machine fitted with a water jet. The CNC machine traversed a bed of dry sand and cellulose binder, forming a train of damp sand that created the students' design. Following this hydroplotting procedure, the sand was dried to harden the binder, forming a rigid formwork into which a self-consolidating concrete mixture was poured.

Aided by University of Stuttgart researchers and students, AE&D students worked together in teams to discover a creative solution to the design challenge. One group designed a hexagonal pattern, another group created a design influenced by the human vertebrae, and the last group investigated moiré patterns of intersecting waves. After a week of iteration and prototyping, the teams presented their work to Northwestern and ILEK professors.

DEPARTMENT INTRODUCES SOIL-STRUCTURE AND SOIL-MACHINE INTERACTION LABORATORY



Professor James Hambleton (right) and his research group with the six-axis robot

Aiming to reinvent how humans interact with earth, Assistant Professor **James Hambleton**'s research group has developed a new lab for advanced physical modeling that will help assess computational models for simulating fundamental processes in soil-structure interaction and soil-machine interaction. The lab uses a fully instrumented six-axis industrial robot and 3D printing to complete tests with a variety of small-scale models for structures and tools operating on a range of soils, including rapidly reconstituted simulants and samples extracted from field sites.

Leveraging advances in 3D printing, Hambleton's group can also test a variety of configurations for the model structures and tools, from traditional forms to more innovative and exploratory designs.

The lab's findings will enhance the performance and safety of geotechnical infrastructure and form the basis for future long-term studies on the optimization and automation of earthmoving machinery and off-road vehicles, enabling new machine designs and techniques.

NEW COURSES LAUNCHED

The Department of Civil and Environmental Engineering is excited to introduce new courses highlighting the challenges facing global societies and how civil and environmental engineers are equipped to find solutions that improve the quality of human life and the integrity of nature.

INNOVATIVE GATEWAY COURSES

Biology, Ecology & Engineering (Prof. Erica Hartmann) explores biological principles and technologies that are transforming the landscape of engineering possibilities.

Engineering Possibilities: Data Science in the Age of Smart Technologies (Prof. Amanda Stathopoulos) examines the future of decision science in a period of unprecedented challenges of climate change, urbanization, and social inequality.

Structural Art (Prof. David Corr) teaches how to interpret the built environment through an examination of the history of structural engineering as a creative art.

Earth System Science: The Anthropocene (Prof. Neal Blair) explores how human activity affect the physical, chemical, and biological processes that have made the Earth habitable.

OTHER NEW COURSE OFFERINGS

Economics & Finance for Engineers (Prof. Pablo Durango-Cohen) teaches fundamental concepts in economics and finance in the context of modern engineering systems.

High Performance Buildings (Joe Burns of Thornton Tomasetti) pursues sustainable design for high performance in building energy, water, and material use.

Energy Law & Policy (Prof. Keith Harley) examines major laws that regulate the acquisition of energy resources, the conversion of resources into usable energy, and transmission and transportation infrastructure.

Yonggang Huang Elected to National Academy of Engineering

Huang recognized for pioneering wearable electronics

Yonggang Huang, Walter P. Murphy Professor of Civil and Environmental Engineering and Mechanical Engineering, was elected to the National Academy of Engineering (NAE), one of the highest professional distinctions accorded to an engineer. Huang was one of 84 new members and 22 new foreign members announced by the NAE in February 2017.

Huang, whose work has led to major advancements in stretchable and flexible electronics with biomedical applications, was cited by the NAE for “pioneering work on mechanics of stretchable electronics and mechanically guided, deterministic 3D assembly.”



Yonggang Huang

“We are tremendously proud of Yonggang,” said **Julio M. Ottino**, dean of the McCormick School of Engineering and an NAE member. “He exemplifies research excellence at the highest level, a strong commitment to education, and outstanding collegiality.”

Huang’s recent work includes a wearable electronic device for on-the-spot health monitoring. Potential applications of his technology include thin

“tattoo-like” sensors placed on the skin; implantable devices, such as pacemakers, defibrillators, and heart-rate monitors; and electrocardiograms and electromyography.

Huang has earned several prestigious honors in the past year, including the Nadai Medal from the American Society of Mechanical Engineers, the William Prager Medal from the Society of Engineering Science, and McCormick’s Cole-Higgins Award for Excellence in Teaching.

FACULTY NEWS



Jan Achenbach received an honorary doctorate from Clarkson University.



Arantzazu Alarcon-Fleming was nominated to the Northwestern Associated Student Government Faculty Honor Roll and named associate professor.



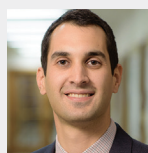
Oluwaseyi Balogun was nominated to the Northwestern Associated Student Government Faculty Honor Roll.



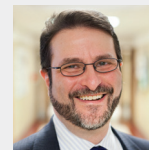
Zdeněk P. Bažant was elected as a foreign member of the Academy of Athens. He also presented plenary lectures at the ASCE Engineering Mechanics Institute annual meeting, the 14th International Congress of Fracture, and the 7th International Conference Fibre Concrete. He was honored for his 80th birthday at multiple symposia, including the Society of Engineering Science annual meeting in Boston.



Charles Dowding was selected by the American Society of Civil Engineers (ASCE) to be honored as a Distinguished Member.



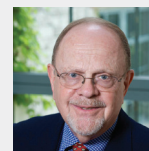
Sinan Ketten took part in NAE’s US Frontiers of Engineering symposium and received a Presidential Early Career Award for Scientists and Engineers (PECASE).



Aaron Packman gave a plenary talk at the International Conference on Groundwater in Bogota, Colombia in August.



John Rudnicki was elected fellow of the American Rock Mechanics Association (ARMA).



Joseph Schofer received the S.S. Steinberg Award from the American Road and Transportation Builders Association. He also gave the 10th Annual Martin Wachs Distinguished Lecture in Transportation at UCLA.

IN MEMORIAM

'The Students' Professor' Edwin Rossow



Edwin Rossow

Edwin Rossow, professor emeritus of civil and environmental engineering, passed away at age 80 on February 5, 2017. Rossow joined the Department of Civil Engineering in 1965, where he specialized in computer methods for the analysis and design of structures. His research contributed to significant advances in structural analysis, steel design, and the behavior of reinforced concrete.

Rossow taught 19 different courses at Northwestern, which were perennially popular among students who were drawn to Rossow's enthusiasm and dedication to their success. As a lasting tribute, Rossow's students honored him by endowing the "Rossow Prize," which recognizes outstanding seniors who demonstrate high potential for professional success in the field of structural engineering.

Environmentalism Pioneer Robert Gemmell

Robert Gemmell, professor emeritus of civil and environmental engineering, passed away at age 84 on September 17, 2017. He will be remembered as a devoted teacher and mentor, dedicated researcher, and valued colleague and friend.

Gemmell was an early pioneer for environmentalism. A member of Northwestern's faculty since 1964, he was an expert on water resources and sanitary engineering. He joined Northwestern from Harvard University, where he served as a lecturer and research fellow. He earned his bachelor's and master's degrees in civil engineering from The Ohio State University and his PhD from Harvard University.

During his time at Northwestern, Gemmell led important research in urban wastewater collection and treatment plants. He also directed a wastewater management study for Lake Michigan



Robert Gemmell

and drew up guidelines for public utilities planning. Committed to understanding how humans affect the environment, he developed two classes for Northwestern that were first offered in 1973: Simulation Models in Environmental Health Engineering and Environmental Impact Analysis.

A member of the American Society of Civil Engineers, Gemmell became a leading authority in the area of water research. He represented Northwestern on a state-wide committee for the Water Resources Center, served on committees for the American Water Works Association and International Water Resources Association, and participated in the First World Congress on Water Resources. He also served as a consultant for government, industry, and non-profit organizations, including the US Army Corps of Engineers, Argonne National Laboratory's Center for Environmental Quality, and the US Department of Housing and Urban Development.

Alumnus Eric Judge

Eric Peter Judge ('15), a graduate of the Department of Civil and Environmental Engineering, passed away suddenly at age 24 on June 18, 2017. Judge had recently relocated to Chicago from New York City to continue his engineering career and to be close to his friends and family.

Judge graduated from the McCormick School of Engineering in 2015 with a degree in environmental engineering. He had countless close friends from Northwestern, where he was a leader in the Lambda Chi Alpha fraternity. Judge was a passionate fan of New York Giants and Northwestern football, enjoyed cooking, documentaries, global travel, hiking and camping, and was an avid beer lover. His love for life, family, and friends was deep. Judge shared his infectious joy with everyone he knew.

ALUMNI ROUND-UP



William Oestreich ('15) entered his first year as a PhD student at Stanford University's Hopkins Marine Station, where he's working to integrate his interests in marine ecology, resource management, and environmental policy to explore management approaches for protecting highly-mobile marine animals.



After serving as a Peace Corps environmental conservation volunteer, **Michael Reiner** ('13) entered the University of Michigan to pursue a dual-degree in environmental engineering and sustainable systems. His current academic and research interests include urban energy justice, energy-efficiency adoption, and sustainable energy infrastructure.



Matthew Shaxted ('11) co-founded Parallel Works, a Chicago-based supercomputing-as-a-service company. In addition to designing and implementing the company's product, he works with Parallel Works customers in the built environment and manufacturing verticals, helping them unlock the power of high-performance computing in their business practices.

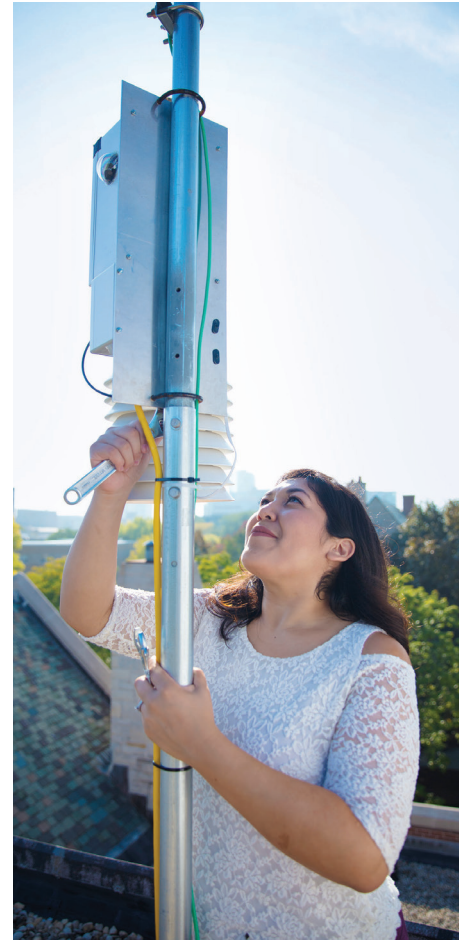


Liz Trumbull's ('14) interest in aging and historic buildings inspired her to pursue a career in historic structures. As a student in the University of Pennsylvania's Master of Science in Historic Preservation program, she studies how historic buildings function, their cultural significance, preservation planning, and management of historic sites. As an intern at Philadelphia's Eastern State Penitentiary, she is researching ways to teach preservation skills via workshops and pre-apprenticeship programs.

“

I decided I wanted to be an engineer when I was in fourth grade. I like the human impact of engineering. Science is very truth oriented, but engineering is more people oriented.

— **LOREN AYALA** ('17), who used her final summer as an undergraduate student studying civil engineering to conduct research on urban flooding.



STUDENT NEWS

Michael D. Aronson received the Wallis S. Hamilton Award for Civil Engineering Senior.

Hannah R. Brady received the Jimie E. Quon Memorial Award for Environmental Engineering Senior.

Kathryn Eckhoff ('17) received the Thornton Tomasetti Foundation National 2017-2018 Scholarship, Alumnae of Northwestern University Graduate Fellowship, AISC Foundation/Associated Steel Erectors Fellowship, and the Department of Civil and Environmental Engineering Edwin C. Rossow Prize for Structural Engineering Senior.

Gordon Kucan received the Edwin C. Rossow Prize for Structural Engineering Senior.

PhD student **Raul Marrero** received a 2017 NSF Graduate Research Fellowship.

Jesse B. Vega-Perkins received the Jimie E. Quon Memorial Award for Environmental Engineering Senior.

Kara Rodby received the Environmental Engineering Senior Award.

PhD student **Paul Roots** received a 2017 NSF Graduate Research Fellowship.

Jingyi Ruan received the Jimie E. Quon Memorial Award for Environmental Engineering Senior.

Kristen M. Smith received the Wallis S. Hamilton Award for Civil Engineering Senior.

Yue Zeng received the Civil Engineering Senior Award.

Architecture Students Build Formwork Skills in Stuttgart

The challenge of designing concrete formwork is to visualize how complex geometries become the negative space of the finished product. Students in the Architectural Engineering and Design program tested their formwork skills during a visit to the Institute for Lightweight Structures and Conceptual Design (ILEK) at the University of Stuttgart in September. Using 3D modeling programs, students displayed creativity as they designed their structures, from a hexagonal pattern to moiré patterns of intersecting waves. After a week of iteration, they presented their work to Northwestern and ILEK professors.

Read more about the trip to Stuttgart on page 7.

