

## The Bridge

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# The Bridge

## Oso Disaster Had Its Roots in Earlier Landslides (continued from page 1)

occurrence, it was not extraordinary," said Wartman.

"We observed several other older but very similar long-runout landslides in the surrounding Stillaguamish River Valley. This tells us these may be prevalent in this setting over long time frames. Even the apparent trigger of the event – several weeks of intense rainfall – was not truly exceptional for the region," Wartman said.

Team co-leader Jeffrey Keaton, a principal engineering geologist with AMEC Americas, an engineering consultant and project management company, said another important finding is that spring of 2014 was not a big time for landslides in Northwest Washington.

"The Oso landslide was the only major one that occurred in Snohomish County or the Seattle area this spring," Keaton said.

Other team members are Scott Anderson of the Federal Highway Administration, Jean Benoit of the University of New Hampshire, John deLaChapelle of Golder Associates Inc., Robert Gilbert of the University of Texas and David Montgomery of the University of Washington.

The team was formed and approved within days of the landslide, but it began work at the site about eight weeks

later, after search and recovery activities were largely completed. The researchers documented conditions and collected data that could be lost over time. Their report is based largely on data collected during a four-day study of the entire landslide area in late May. It focuses on data and observations directly from the site, but also considers information such as local geologic and climate conditions and eyewitness accounts.

"For me, the most important finding is that we must think about landslides in the context of 'risk' rather than 'hazard,'" Wartman said. "While these terms are often used interchangeably, there is a subtle but important difference. Landslide hazard, which was well known in the region, tells us the likelihood that a landslide will occur, whereas landslide risk tells us something far more important – the likelihood that human losses will occur as a result of a landslide.

"From a policy perspective, I think it is very important that we begin to assess and clearly communicate the risks from landslides," he said.

*By Vince Stricherz. Article reprinted and edited from UW Today. ■*

# The **Bridge**

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## Oso Disaster Had Its Roots in Earlier Landslides

The disastrous March 22 landslide that killed 43 people in the rural Washington state community of Oso involved the “remobilization” of a 2006 landslide on the same hillside, a new federally sponsored geological study concludes.

The research indicates the landslide, the deadliest in U.S. history, happened in two major stages. The first stage remobilized the 2006 slide, including part of an adjacent forested slope from an ancient slide, and was made up largely or entirely of deposits from previous landslides. The first stage ultimately

moved more than six-tenths of a mile across the north fork of the Stillaguamish River and caused nearly all the destruction in the Steelhead Haven neighborhood.

The second stage started several minutes later and consisted of ancient landslide and glacial deposits. That material moved into the space vacated by the first stage and moved rapidly until it reached the trailing edge of the first stage, the study found.

The report, released on the four-month anniversary of the slide, details an investigation by a team from the Geotechnical Extreme Events Reconnaissance Association, or GEER, co-led by Dr. Joseph Wartman, CEE associate professor. The scientists and engineers determined that intense rainfall in the three weeks before the slide likely was a major issue, but factors such as altered groundwater migration, weakened soil consistency because of previous landslides and changes in hillside stresses played key roles.

“Perhaps the most striking finding is that, while the Oso landslide was a rare geologic



Photo courtesy of Gordon Farquharson / UW

*Continues on back cover.*

## New Bridge Design Improves Earthquake Resistance and Construction Speed

UW Civil Engineering researchers have developed a new design for the framework of columns and beams that support bridges, called “bents”, that is intended to improve performance. The improvements come in the form of better resistance to, and less damage from, earthquakes, and through faster construction on site. The faster construction is achieved by pre-fabricating the columns and beams off site, after which they are shipped to the construction site where they are erected and connected quickly.

The team members include Professors John Stanton and Marc Eberhard, and Graduate Research Assistants Travis Thonstad and Olafur Haraldsson from the University of Washington.

Pre-fabrication implies the need for connections, and therein lies a major difficulty for bridges in

*Continues on page 13.*



## Message from the Chair

Greg Miller

During my time as chair writing for these newsletters I have been discussing growth and access issues with perhaps monotonous frequency. The primary reason for this is because of the importance of the issue for our students, our profession, and the state. I've also learned that it takes sustained effort to make things happen at a large organization like the UW, and this particular problem defies quick and dirty solutions. So, at the risk of appearing to be stuck on a particular soapbox, I'd like to give an update on where we stand at present.

First of all, it makes sense to report on our progress to date. We have had good success in rebounding from the worst of the economic downturn, and we have been able to hire a number of outstanding new faculty members. Much of this hiring has been linked to anticipated or realized retirements, but there has been growth, as well. Based on this year's departmental admissions, we expect by June 2016 to produce our largest graduating class of BSCes in recent history. Our graduate program applications and enrollments remain strong, as well, and our recently launched online master's degree programs have gotten off to good starts, joining our original online Construction Engineering MSCE program that has been running for more than a decade. Undergraduate students can now enter the department directly as incoming freshman, as rising sophomores, or at the beginning of the junior year. As with all College of Engineering departments, admission to CEE remains competitive, but there are more opportunities for students to become involved in the life of the department earlier.

These are all good trends, but there have been a number of associated challenges. Because we are now responsible for growing numbers of students beyond just their junior and senior years, advising and other staff support demands have increased, as well. We remain constrained in regards to the size and quality of our instructional and research space (the last major investment in CEE facili-

*Continues on page 6.*

## CEE Welcomes New Faculty



David Butman

David Butman joined the department as assistant professor in Civil and Environmental Engineering and the School of Environmental and Forest Science this fall. He received his PhD in Forestry and Environmental Studies from Yale University, a Masters in Environmental Science from the Yale School of Forestry and Environmental Studies, and a B.A. in Economics and Environmental Studies from Connecticut College. Dr. Butman comes to CEE from

the U.S. Geological Survey and Yale University where he was a postdoctoral associate involved in a national assessment of carbon sequestration potential within natural ecosystems. His focus is on freshwater environments.

Dr. Butman studies the influence of humans and climate on carbon cycling at the intersection of terrestrial and aquatic systems. Through the use of satellite remote sensing, targeted field campaigns and watershed modeling, Butman quantifies the capacity of natural ecosystems to change as a result of anthropogenic carbon emissions; human landscape alteration, like logging or development; and the effects of climate change, in order to identify environmental stressors within watersheds and mitigate long term resource degradation. Butman received the NASA Earth and Space Science Fellowship, the Teresa Heinz Scholars for Environmental Research Scholarship, the Woods Hole Oceanographic Institution Research Initiative Fellowship, and was invited as a Climate Change Scholar at the DISCCRS VII symposium.



Ed Kolodziej

Ed Kolodziej, associate professor in environmental engineering, has joined CEE as part of the Freshwater Science Initiative after seven years at the University of Nevada, Reno, where he was also an associate professor in Civil and Environmental Engineering. He holds a joint appointment with Interdisciplinary Arts and Sciences at UW Tacoma, and is affiliated with local and regional water quality efforts through The Center for Urban Waters (<http://www.urbanwaters.org/>).

Dr. Kolodziej began his academic studies with a B.S. in Chemical Engineering from the Johns Hopkins University, after

*New Faculty biographies continue on page 4.*

## Remembering Professor Alan Mattock



*Alan Hanson Mattock*

Alan Hanson Mattock, Professor Emeritus since 1991, passed away unexpectedly on June 6th at his son's home in California. He joined the department's faculty as a Professor in 1964. He was a pioneering educator who did much to advance the US and Washington State's precast and prestressed concrete industries.

Alan was born January 1925 in Halifax, Yorkshire, England, and graduated from Halifax Technical College with a B.Sc in Engineering and First Class Honors. In 1947 he received a Royal Scholarship to Imperial College, London, and was awarded a M.Sc by that institution in 1949 for a thesis on the design of prestressed concrete beams. That year, he married Margaret and they then spent three years in British Guiana (Guyana), South America, where Alan worked as a District Engineer. On their return to London, Alan was appointed as a

Lecturer in Civil Engineering at Imperial College and received his Ph.D. there in 1955 for a thesis on the ultimate strength of prestressed concrete beams.

In 1957, Alan and Margaret moved to the US. Alan joined the Research and Development Laboratories of the Portland Cement Association in Skokie, IL as a lead researcher. After seven years, during which he established a solid US reputation in the emerging field of precast and prestressed concrete, he was recruited by the UW's Dean of Engineering Charles Norris to be the professor heading the department's structural engineering program.

Alan published over 100 papers on concrete structural systems in various professional journals and published and actively participated in research until his death. He was a member of the 50-person Committee 318, which developed the American Concrete Institute's (ACI) Building Code, for 24 years starting in 1971. He was made an Honorary Member of ACI in 1994 for his highly meritorious service to ACI in providing invaluable expertise on the behavior and strength of structural concrete members. For those contributions he was also named a Fellow of ACI, a Fellow and Titan (2004) of the Precast Prestressed Concrete Institute (PCI) and a Legend (2005) of the Post-Tensioning Institute (PTI). Among many other awards he received ACI's Kelly award in 1991 for his "dedicated guidance" of students and a Special Award from PCI in 1990 for "his published works that have led to improvements in the design of prestressed concrete structures." Alan had an uncompromising approach to quality in his work and that of his students. His planning for his experiments was impeccable so that he always seemed to get the results he expected.

His former students gratefully remember his "dedicated guidance." Alan was the faculty member who inspired Steve Seguirant, Director of Engineering at Concrete Technology in Tacoma, to become interested in concrete. Some 35 years later Steve still uses the notes that Alan handed out in class, in lieu of a textbook. Alan inspired Professor Emeritus Jun Yamazaki of Nihon University in Japan to translate his class notes into Japanese. Jun found that Alan's "exceptionally good education continued to give him a basis for his daily activities" and that "his gentle humor warmed up his rigor in scientific pursuit." Alan was a delightful gentleman, a great colleague, and a wonderful mentor to many structural engineering faculty, students and design engineers.

*By Neil Hawkins and John Stanton.* ■

## Linda Boyle Appointed Chair of ISE



*Linda Boyle*

Dr. Linda Boyle joined the faculty as an associate professor in 2009 with a joint appointment in CEE and Industrial &

Systems Engineering (ISE). Linda's promotion to professor was confirmed in spring of 2014 and she was appointed chair of ISE this September.

Dr. Boyle received her Master's ('94) in Inter-Engineering with an emphasis on Human Factors and PhD ('98) in Civil and Environmental Engineering from the University of Washington. Her research centers on driving behavior, crash countermeasures, crash and safety analysis, and statistical modeling. She brings to the Chair's office a high level of energy and enthusiasm and a passion for education, ISE as a field, and multidisciplinary collaboration. ■

For his contributions he was named a Fellow of ACI, a Fellow and Titan of the Precast Prestressed Concrete Institute (PCI) and a Legend of the Post-Tensioning Institute (PTI).

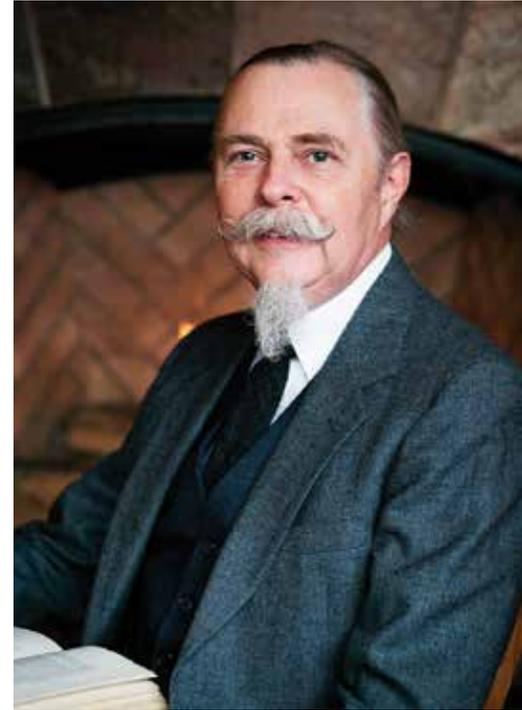
## Professor Donald J. Janssen Retires

After well over two decades on the CEE faculty, Professor Donald J. Janssen retired September 2014. Specializing in portland cement concrete and constructability-related issues, Janssen has a considerable record of contribution in the area of construction. As a teacher and research advisor, his mentorship and care for student learning impacted many.

“Don Janssen is an amazingly caring man,” said CEE student Ben Swarmer. “He will always spend extra time with students who ask, whether to help them catch up or increase the learning beyond what he teaches in lectures. As my research advisor, he encouraged me to take full control of the project and motivated me to supersede my own goals and expectations.”

Professor Janssen worked closely with the students involved with the ASCE Concrete Canoe, as well. “His advice was key to the Concrete Canoe Team’s success,” said Stuart Kretzschmar, CEE student. He was also “a great teacher and advisor... I only had the opportunity to take two classes from him, but those classes were two of the best classes I took.”

Janssen earned his doctorate at the University of Illinois. He is a fellow of the American Concrete Institute, and his honors include nominations for the UW’s University Distinguished Teaching Award and a Favorite Professor in the UW Alumni Association’s poll of the class of 2006. ■



Donald J. Janssen

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## New Faculty *(continued from page 2)*

which he focused more on environmental issues and went to the University of California at Berkeley where he received his M.S. and Ph.D in Environmental Engineering.

Kolodziej investigates water quality and contaminant fate in natural and engineered systems, focusing on interdisciplinary approaches to complex environmental issues. He is interested in understanding how contaminant exposures affect aquatic organisms and ecosystem health and the subsequent control of problematic contaminants in the aquatic environment. His research group focuses upon the characterization and control of non-point source pollution, understanding attenuation mechanisms in natural systems, and the optimization of engineered systems for trace contaminant removal. His research has recently been published in *Science*, and featured in news media such as *Nature*, *Scientific American*, *U.S. News and World Report*, *Yahoo Health News*, *BBC Radio’s “Inside Science”*, and the *Huffington Post* among others.



Richard Wiebe

The Department of Civil and Environmental Engineering welcomes Richard Wiebe, assistant professor in structural engineering and mechanics. Dr. Wiebe earned his Ph.D. from Duke University, his Master’s from the University of Waterloo, and Bachelor’s from Lakehead University, all in Civil Engineering. After completing his Ph.D., he spent time at the U.S. Air Force Research Laboratory, where he investigated aerospace structures in extreme environments.

Wiebe’s research is focused on experimental and computational nonlinear dynamics, including the study of high-speed lightweight aerospace structures, seismic analysis of civil structures, damage detection and health monitoring, and energy harvesting. The overriding goal of his research is to exploit rather than avoid nonlinearities to improve the structures that civil, mechanical, and aerospace engineers develop. ■

## PacTrans Receives \$5.2 Million Grant



The U.S. Department of Transportation announced June 18 that the University of Washington will receive \$5.2 million in funding for the Pacific Northwest Transportation Center (PacTrans) to continue serving as the USDOT Region 10 University Transportation Center.

PacTrans engages in multi-university research in traffic safety and applies advanced technology solutions to help improve the safety of drivers, pedestrians, and bicyclists. Spanning across four Northwest states, PacTrans is comprised of transportation professionals and educators from Oregon State University, the University of Alaska,

Fairbanks, University of Idaho, Washington State University, and the University of Washington.

“Considering the transportation challenges facing America, our country needs the innovative research being done by UW and its partner institutions to build a better legacy for our children,” said Sen. Maria Cantwell.

Under the direction of Dr. Yin Hai Wang, CEE professor of transportation engineering, the center will focus on enhancing the safety of road users, transportation infrastructure and system operations in the Pacific Northwest. “Our center’s role is not simply performing research; we also communicate with people, such as carrying out outreach programs to come to elementary and high schools,” Wang said. ■

## Students Return to Renovated More Hall Workspace

A number of graduate students returned to More Hall this past fall quarter to find their workstations and offices with brand new desks, coats of paint, and flooring. Through a combination of department and gift funds, along with a matching contribution from the College of Engineering Dean’s Office, students in the Transporta-

tion, Construction, and Structures areas now have a newly remodeled place to hang their hat while they conduct their research and pursue their degrees.

Projects like the one described above were made possible through generous gifts, such as the ones made through the CEE Strategic Support Fund. ■

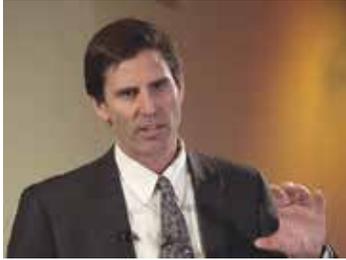


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## Annual Evans Lecture Underscores Wind, Water, and Solar Power Solutions



Dr. Mark Z. Jacobson

The 2014 Daniel L. and Irma Evans Lecture took place on Thursday, May 15, 2014 and featured Dr. Mark Z. Jacobson, Professor of Civil and Environmental Engineering, Director of Atmosphere / Energy Program at

Stanford University. Dr. Jacobson presented his lecture, "Roadmaps for transitioning Washington State and all other 49 U.S. states to wind, water, and solar power for all purposes." Dr. Jacobson noted premature deaths caused by air pollution, rising global temperatures, the disappearance of the Arctic sea ice, and increasing pollution, energy prices, and economic, social, and political instability as significant issues that required sustainable solutions. Dr. Jacobson recommended wind, water, and

the sun as the cleanest solutions to global warming, air pollution, and energy security. By 2020-2030, Dr. Jacobson explained that energy solutions that employ onshore and offshore wind, geothermal, hydroelectric, solar, tidal, and wave technologies would cost approximately four times less than conventional fuels.

The Daniel L. and Irma Evans Lectureships provide opportunities to expose students and practitioners of engineering to the concepts, challenges, concerns and methods of the major disciplines with which they will be expected to interact in their careers, and to deepen their understanding of engineering. Dan, Roger and Robert Evans established the Daniel L. and Irma Evans Endowment in 1983 to memorialize and honor the human and broad societal outlook of their parents.

Watch the lecture at <http://www.ce.washington.edu/news/video>. ■

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### Message from the Chair *(continued from page 2)*

ties was in the 1940s, and we currently have faculty and students scattered among five separate buildings). We have a number of scholarship funds and endowments that provide critical financial support for our students, but between higher tuition rates due to reduced state funding, and our increasing freshman and sophomore enrollments, we are struggling to provide adequate support for students in need, and to make competitive offers to top students who can easily choose other engineering disciplines or other institutions.

We have made strides with respect to keeping up with increased staffing needs, improving our facilities on the margins, and expanding our scholarship funding base (the latter two in particular helped by alumni giving), but we still have much further to go. It's still unclear what the impact on higher education will be from the McCleary Decision requiring substantially increased K-12 funding, but in my mind it indicates the need to consider education funding from a K-16 perspective, or else we will be in danger of starving one to feed the other. We certainly hope the recent legislative reinvestments in engineering programs do not get reversed in the coming year.

During this past academic year, our new dean, Mike

Bragg, formed a college-wide committee to look at issues of demand and capacity, and to make recommendations concerning growth targets and growth mechanisms for the College of Engineering. I served as chair of this committee, and our findings and recommendations were in full alignment with what has been the case within CEE: student demand and societal demand as reflected in population demographics, statewide employment projections, economic analysis of the impact of engineering jobs, and the nature of Washington's economy, in particular, all point to a need and opportunity to increase the state's capacity to educate engineers. The UW cannot singlehandedly fill this need, but we can play a central role given our location, history, and size. Recent and ongoing architectural studies indicate that we have the ability to grow our physical capacity by prudent building/rebuilding in our current footprint, with highly favorable economics compared to spawning new institutions. I expect the College of Engineering to increase its public communication of this situation in the coming year, and as always, support from our alumni and professional colleagues will be much appreciated as we work on getting this story out, and following up with appropriate actions. ■

## X-Ray Computed Tomography Scanner Comes to UW

A new high-tech piece of research equipment will be making its way to the UW thanks to an interdisciplinary team led by Jeff Berman, associate professor in CEE. A successful million dollar Major Research Instrumentation Grant from the National Science Foundation (along

The scanner will be used by researchers campus-wide. It will enable CEE researchers in structural engineering to identify damage in critical components of large-scale infrastructure that are tested in the UW Structural Research Laboratory (SRL). CEE geotechnical engineers

will use the scanner to study soil deformation under various loading conditions. CEE, ME and AA researchers will use the scanner to investigate fiber orientation and crack propagation in composite materials (fiber reinforced polymers) for civil infrastructure and aerospace applications. ME researchers developing 3D printing processes will use the scanner for nondestructive evaluation of internal and external geometry of printed parts. Researchers in biological systems from anthropology, biology and the Burke Museum will scan large skeletal re-

mains, fossils and recently deceased animals to determine exact geometries and use the data in the development of bio-mechanical models. Users of the Washington Nano-



Photo courtesy of North Star Imaging, Inc.

with over \$400k of UW matching funds) was obtained to purchase a unique X-Ray Computed Tomography (CT) Scanner, illustrated in the figure. The scanner is capable of penetrating through parts as dense and thick as 7.5 cm of steel while generating 3D images of the inside and outside of parts with resolution as small as 2 microns. Of great importance to CEE researchers is that the scanner can be used for very large parts, up to 1.2m x 0.84m x 0.84m. The system consists of two different X-Ray sources, one very high-intensity and one lower intensity to provide a broad range of scanning applications. Parts are placed inside a lead and steel case that is approximately a 3 meter cube. A robot inside the case manipulates the part, spinning and rotating it while the X-Rays scan through the various orientations. A high speed computational workstation then does a digital 3D reconstruction of the part, allowing researchers to view the inside of objects with high resolution, generate high-accuracy drawings, and output the information to finite element analysis software to determine how the part will behave under load.

The scanner is capable of penetrating through parts as dense and thick as 7.5 cm of steel while generating 3D images of the inside and outside of parts with resolution as small as 2 microns.

fabrication Facility will use the scanner to do nondestructive evaluation on electronic sensors and microchip fabrications. Look for demonstrations of the scanner at future College of Engineering Discovery Days. ■

## Awards and Accolades

### Faculty Honors

#### **Dodd Receives Outstanding Reviewer Award**

Environmental engineering assistant professor Michael Dodd received an Outstanding Reviewer award from ASCE's Journal of Environmental Engineering. Recipients of the review award are selected by journal editors each year on the basis of the high quality and frequency of their reviews.

#### **Lundquist Receives Editor's Choice Award**

Dr. Jessica Lundquist, associate professor of hydrology, CEE graduate students Susan E. Dickerson-Lange and Nicoleta Cristea, and James Lutz of Utah State University received the Editor's Choice Award from Water Resources Research. This award recognizes a paper they co-authored, "Lower forest density enhances snow retention in regions with warmer winters: A global framework developed from plot-scale observations and modeling," published in Water Resources Research (October 2013). Only one percent of published papers in a calendar year receive the award, given in recognition to scientists and students for outstanding work.

#### **MacKenzie Receives Barry McNutt Award**

Dr. Don MacKenzie, assistant professor of transportation engineering, and co-authors Stephen Zoepf and David Keith of MIT, and William Chernicoff of Toyota received the 2014 Barry McNutt Award from the Transportation Research Board. The award recognizes "outstanding contributions to the development of efficient and effective federal policies related to the automotive sector," and was given for the paper, "Charging Choices and Fuel Displacement in a Large-Scale Plug-in Hybrid Electric Vehicle Demonstration," published in the Journal of the Transportation Research Board (2013).

#### **Korshin Receives Fulbright Award**

Professor Gregory Korshin has been selected for a 2014-15 Fulbright award to Italy. The Fulbright Scholar Program offers US scholars in all academic ranks the opportunity to lecture and conduct research at Italian universities and research centers. Awards aim to foster the advancement of knowledge in scientific fields of global significance and in priority areas as identified in the scientific cooperation agreement between Italy and United States.

#### **Eberhard, Stanton, Haraldsson Receive 2014 T.Y. Lin Award**

CEE faculty member Marc O. Eberhard, John F. Stanton, professors of structural engineering, and Olafur S. Haraldsson, M.S. '11, received the 2014 T.Y. Lin Award from the American Society of Engineers (ASCE). This award, which recognizes papers that contribute to the field of prestressed concrete, was given for the paper "Accelerated bridge construction in Washington State: From research to practice."

### Student Honors

#### **Tony Nguyen Receives National Council of Structural Engineers Association Scholarship**

Tony Nguyen, master's student in structural engineering, received the NCSEA Young Member Scholarship to the 2014 Annual Conference in New Orleans, Louisiana on September 17-20. Only six structural engineers 36 years old and younger received this award throughout the nation. Carrie Johnson, current president of NCSEA, commented, "The quality of submittals was outstanding. We were very impressed to see the level of understanding of complex issues facing structural engineers today."

#### **Peiran Zhou Awarded STAR Fellowship**

Environmental engineering graduate student Peiran Zhou has been awarded a prestigious STAR fellowship from the US EPA for his work on "Sunlight-driven Photolysis of Chlorine to Reactive Oxygen Species for Enhanced Inactivation of Chlorine-resistant Microbial Pathogens." The STAR fellowship, which provides a total of \$42,000 per year for tuition, stipend, and research expenses, is awarded to a limited number of highly qualified graduate students each year. Only 98 of these highly competitive fellowships were awarded nationwide during this most recent submission round.

#### **Yeping Yuan Receives Lorenz G. Straub Award**

CEE doctoral graduate, Yeping Yuan, was selected as the recipient of the 2012 Lorenz G. Straub Award for her dissertation, "Impacts of lateral spreading and upstream conditions on buoyant river plumes: mixing, structure and plume dynamics," completed under the direction of associate professor Alex Horner-Devine. Established under the Lorenz G. Straub Memorial Fund, this award is given for the most meritorious thesis in hydraulic engineering, ecohydraulics, or related fields. The competition is international, and nominations may be made by any recognized civil and environmental engineering program in the world. (The award for a particular year is presented well after that year is over. The year represented is the year the dissertation was completed.)

#### **CEE Team Makes Esri Climate Resilience App Challenge 'Top 13'**

In support of the White House Climate Data initiative, Esri, the world leader in mapping technology, hosted the Climate Resilience App Challenge March 9 through June 2, 2014. The challenge called for developers to create desktop, web, or mobile apps that enable communities to see, understand, and prepare for a more resilient and sustainable future. The CEE team from Erkan Istanbuluoglu's Ecohydrology Research Group included Ronda Strauch, Zhuoran Duan, Christina Bandaragoda, Sivi Ahopelto, Sai Nudurupati, and Omer Yetemen. Their culvert app submittal placed in the top 10 runner-ups in the international competition.

#### **Kathryn DeBenedetto Receives Mary Gates Research Scholarship**

Kathryn DeBenedetto received a 2014 Mary Gates Research Scholarship for her research on the Characterization of Endocrine Disrupting Compound-degrading Bacteria Isolated from Activated Sludge, working with Dr. Heidi Gough, research assistant professor of environmental engineering, and Nicolette Zhou, PhD candidate. Research Scholarships allow students to deepen their involvement in work with faculty on research, curricular design, the creative arts, and other forms of scholarly endeavor. ■

## Updates from the Arctic: Jim Thomson on Big Waves and Ice Loss

The Arctic is a place for serious engineering. Each winter, the entire region is covered in ice and snow, and each summer the ice and snow retreat to expose a fragile tundra... and a vast ocean. In recent years, the summer melt has been extreme, and the effect on the coasts and oceans has been commensurate. In 2012, we started a new project, funded by the Office of Naval Research, to study the change in ocean waves during the summer season. Previously, there were only very small waves in the Arctic Ocean, but with retreating ice there is now more space for waves to form. That's likely to change the conditions for coastal structures and marine operations.



The generation of ocean waves requires time and space for the wind to act and build up the waves. The space is termed the “fetch”, and that is the parameter that changes dramatically in the Arctic during the summer months (when the sea ice melts). We recently published results from a year-long mooring deployment showing that fetch changes are the leading determinate of wave heights in the Arctic. We also showed that an unprecedented observation of 5-meter high waves in the Beaufort

Sea during September 2012 was the direct result of the large fetch that developed during 2012 (the lowest ice season on record).

Now, in 2014, we have been continuing this study and focusing on the details of what happens when the waves approach the ice edge. This is significant because of the potential for feedback between the ice and waves: if the waves break up the ice, there will be more fetch to generate waves, and then there will be more waves to break up the ice. We have deployed several SWIFT buoys, designed and built in our group at the UW Applied Physics

Laboratory, to measure the waves, as well as the winds and the turbulence that occur during wave breaking.

As I write this, we are about to leave for Alaska to board the R/V Norseman II and recover the SWIFT buoys, along with several other autonomous instrument platforms deployed by colleagues at UW and around the world. Two CEE graduate students, Seth Zippel and Madison Smith, are coming on the expedition and will use the results towards their PhD studies. Seth will study the changes in turbulence and mixing that occur when the waves enter the ice and become damped by the ice. Madison will study the damping, or attenuation, of the waves in the ice, as well as the changing character of the waves in the presence of a changing wave climate.

In addition to the waves getting bigger with increasing fetches, it is likely that the waves evolve into longer swells, which carry more energy than the shorter waves. These wave parameters are key for engineering resilient structures at the coast and for safe operations at sea. Our research aims to understand these waves and inform future scenarios for conditions in the emerging Arctic.

*By Jim Thomson* ■

## Results: 2013-14 Giving Overview

In Fiscal Year 2014 (July 1, 2013 – June 30, 2014) CEE continued to see steady growth in community investment. In terms of both dollars and donors, we saw an uptick in support since FY2012. (See Overall Giving chart below).

### CEE Strategic Support Challenge Complete

In spring 2013, CEE launched its Strategic Support Challenge aiming to increase annual support of its key

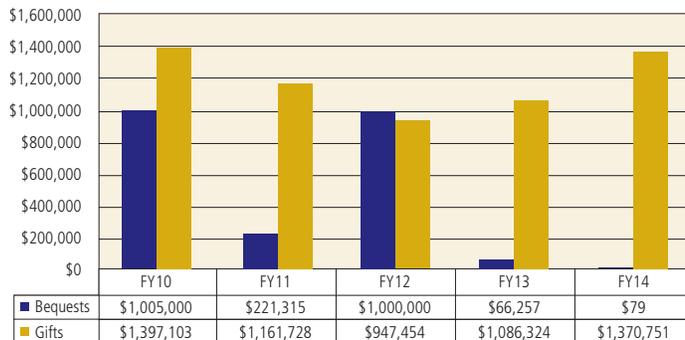
unrestricted fund. \$50,000 in matching money was made available for any new or

upgraded gift of support in the amount of \$500 or more. We're pleased to report 30 alumni took advantage of this matching incentive, generating more than \$106,000 for the CEE Strategic Support fund. Thirteen alumni became donors for the first time, while the remaining alumni increased their annual support.

Gifts to the CEE Strategic Support Fund help the department meet the growing need for qualified engineers by increasing access to CEE degrees. Gifts to this fund provide supplemental scholarship and fellowship resources; enhance and expand classroom and lab space; and support recruitment of excellent faculty to serve our growing, top-notch student body. ■

Fiscal Year	DONORS
2014	470
2013	468
2012	418

Overall Giving to CEE FY09 - FY13



*Gifts = Gifts of all size, private grants, pledges and matching gifts. Bequests = Realized bequest gifts from donors' estates. Since bequest gifts are difficult to predict, it is beneficial to look at fundraising results without them included. Our current five-year average is more than \$400k above where it was prior to the launch of the last campaign (ending FY08).*

CEE Strategic Support Challenge

## Leading Excellence: The CEE Visiting Committee

The CEE Visiting Committee was established in 2010 under the leadership of Chair Greg Miller with the goal of increasing external involvement in the department. The CEE VC convenes twice a year to receive updates, provide recommendations to the chair, and share insight from industry and the broader civil and environmental engineering community. Committee input has impacted such things as changes within junior year curriculum to better meet industry need and the growth of the department's overall alumni and community outreach efforts. ■

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## New Bridge Design *(continued from page 1)*

earthquake-prone regions. The connections need both to survive earthquake shaking and to permit easy assembly, and designing for both is a real challenge because the two requirements tend to impose mutually exclusive constraints. However, the team has found a design that meets the goals, and it uses only common construction materials, which should smooth the way for acceptance of the new approach by owners and contractors.

An important feature of the new system is that the columns are pre-tensioned. A good analogy is to think of a series of child's wooden building blocks, each with a hole through it. Stack them on top of one another, put a rubber band through the central hole, stretch it tight and anchor it at each end. The rubber band keeps the blocks squeezed together. Now stand the assembly of blocks up on its end and you have a pre-tensioned column. If the bottom of the column is attached to a foundation block, you can push the top sideways (as would an earthquake), but the rubber band just snaps the column back upright when you let go. This "re-centering" action is important because it ensures that, directly after an earthquake, the bridge columns are vertical and not leaning over at an angle. This means that the bridge can be used, for example, by fire and medical vehicles, in the critical minutes immediately following the earthquake.

In place of the rubber bands, the real bridge columns use very high strength steel cables, which are embedded in the concrete at the plant where the columns are fabricated. The columns also contain some conventional rebar, which is installed in the fabrication plant. It yields alternately in tension and compression as the column rocks, and dissipates energy to provide the damping needed to limit the amplitude of the bridge's motion during the earthquake. The use of a spring element and a damping element in parallel mimics an automobile suspension.

When the columns rock during an earthquake, they experience very high local stresses at the points of contact, and without special measures the concrete there would crush. To counteract this possibility, the researchers protected the ends of the columns with short steel tubes, or "jackets", that confine the concrete, a little like the hoops of a barrel.

Team members Olafur Haraldsson, Jeffrey Schaefer and Bryan Kennedy first conducted cyclic tests of the critical connections at the UW, and demonstrated that the system can deform during strong earthquakes and then return to vertical with minimal damage. Then the UW team, led by Travis Thonstad, designed and fabricated the components



*One of the bridge columns at the end of all the shaking table tests.*

for a 25% scale bridge to be tested at the earthquake shaking table facility at the University of Nevada, Reno. The components were trucked to Reno, where the Nevada part of the team, consisting of Professor David Sanders and Graduate Research Assistant Islam Mantawy, assembled the pieces and conducted the testing.

During the shake table testing, the only surprise was that the bridge performed even better than expected. The columns returned to true vertical after every one of the 25 ground motions, including the largest ones that had been expected to cause serious damage, if not collapse. The damage to the concrete was purely cosmetic, as can be seen in the photo, taken after the completion of all testing. (The rusty steel column behind the concrete bridge column is part of the lab structure, and indicates how well the bridge returned to vertical after the ground motion stopped.) The internal steel reinforcement did suffer damage, at almost exactly the predicted level of shaking, but nonetheless the bridge was still standing and was judged to be safe for the passage of emergency vehicles even after the largest ground motion, equivalent to 1.5 times the Maximum Credible Earthquake.

The success of the new system in both speeding up construction and improving earthquake performance has attracted the attention of DOTs. The researchers will work with them to implement the ideas in the field. ■

## Engineering in Europe:

### Molly Johnson Reflects on DCI/HDG Travel Scholarship

In the midst of an intense thesis writing process, I was awarded with the 2014 European Travel Scholarship from DCI Engineers and HDG Architecture for my video entry. As the lucky winner, they paid for and arranged my travel and accommodations to Rome, Florence, Paris, and Barcelona for five days each over the summer. I wrote a travel blog (found at <http://www.dci-engineers.com/travelblog>) as part of the scholarship, documenting the amazing experience, in particular focusing on art, architecture, structural engineering, construction, and history that inspired me in each city.

My view of the world was in a constant state of flux throughout my adventure. The ever-present reminder of how much of the world exists outside our own lives was rejuvenating. Wandering down tiny alleys brimming with local life, eating bruschetta with wine in hidden Italian restaurants, ducking for cover in torrential downpours outside the Vatican, eating delectable dinners in charming cafes by the Sacré Couer, relaxing on the soft sands by the calming Mediterranean, and exploring new cities with people I love was invigorating. This trip provided a reminder to look up, open my eyes, and focus on what the world is offering.

As designers, our job is to make the client's imagination a tangible reality. We embrace their thoughts and ideas and work to bring them to life. It is much easier to do

when we ourselves step out from the number crunching, the coordination, and the ever-growing to-do lists we have and enjoy the creative process. It is easy to run on autopilot, but it is truly remarkable to be aware of your surroundings and your accomplishments each day.

Blogging for DCI and HDG each day helped me to take time and reflect and process everything I had experienced in the day. As many of you know, earning your degree requires dedication and hard work – it is not easy. But opportunities such as this travel scholarship make every second worth it; they remind you of why you want to be in the field, and serve to inspire you from seeing evidence of people who have broken boundaries and succeeded when told they couldn't.

This trip was an amazing opportunity and I look forward to following the next lucky student's journey!

*By Molly Johnson, M.S. '14* ■



## CEE Concrete Canoe Makes National Competition, Strides in Fundraising

Every year, the American Society of Civil Engineers holds regional and national competitions for universities across the country in an event that would seem unconventional to most: racing canoes made entirely of concrete. This past year, the University of Washington Concrete Canoe team made their mark in the Pacific Northwest Regional Competition, proving their worth against over twenty other schools. Hosted by Portland State University, the UW's canoe was judged on several different criteria: overall exterior aesthetics, oral presentations showcasing the engineering behind the design and construction of the canoe, as well as two days of intense races between all participating schools. After a unanimous first place finish in Portland, the Huskies were propelled to the University of Pittsburgh in Johnstown, PA for the 2014 ASCE National Concrete Canoe Competition.

The national competition proved to be a much more demanding

test, with top schools from all over the country also showcasing their high end concrete canoes. Although the Huskies ended up finishing 18th out of 23 teams, simply being at the national competition proved to be a great learning experience for the entire team. Current 2014-2015 co-captain Nigel Lyons explained, "The national competition itself was eye-opening. We now know what it will take to compete at the national level in coming years, which in itself was extremely valuable for us. The whole experience was also a great opportunity to bond as a team as well as meet other passionate civil engineering students. All I can say is that, with what we've learned this past year, I can't wait to make a run at the national competition next year."

The Husky Canoe team still made great strides towards their future success, highlighted by the successful implementation of a new fundraising system called USEED. Using USEED, an online platform

## 2014 CEE Graduation Celebration

A celebratory crowd gathered in the HUB Ballroom on Sunday, June 15 to honor the latest graduating CEE class. Dr. Greg Miller, CEE Chair, emceed the CEE Graduation Celebration, which featured several speakers, faculty and student awards, and a reception following the program. The happy graduates represented 100 bachelors degrees, 95 masters degrees, and 14 doctoral degrees. The Master of Sustainable Transportation saw an important milestone with its first graduating class and awarded 13 degrees.

Keynote speaker Dr. Stephen Burges, CEE Professor Emeritus, welcomed graduates to the profession, and student speaker Lucas Whitesell noted Professor John Stanton's guidance well before his CEE major was declared.

Faculty awards, determined by the vote of graduating CEE students, were presented in recognition of outstanding teaching and mentoring.

Dr. Stanton received the 2014 Outstanding Faculty Mentor Award. Students described Dr. Stanton as an exceptional resource, with one student remarking that "I have received valuable advice from him about how to design a number



of systems, courses to take in school, and career decisions after graduation." The 2014 Outstanding Teacher Award was given to Dr. Stephen Muench, who was described as displaying "a real interest in student development and is always available."

The Neil and Ann Hawkins Prize, established in 1989 by Professor and former Chair Neil Hawkins and his wife, Ann, annually recognizes two outstanding BSCE graduates who have demonstrated high academic achievement, leadership and service to the civil engineering community and/or the department. First prize was awarded to Lim Sam Adiputra, and second prize went to Lily Grimshaw.

Tying past and present graduates together was the recent tradition of recognizing the 50th reunion class at the CEE Graduation Celebration. Those of the reunion class in attendance are provided with a Stole of Gratitude and invited to walk in the procession with faculty and graduates.

The ceremony closed to the cheers of over 850 family and friends as graduates tossed their caps in celebration. ■



2014 Concrete Canoe Team in regional competition at Portland State University.

specifically for higher education crowdfunding, the campaign involved an online webpage devoted entirely to the team's mission of personally funding the travel expenses associated with the 2014 national competition. Unlike fundraising efforts of teams past, the 2013-2014 team did not just limit their donor list to local engineering companies; friends and family of team members, as well

as alumni were all included in the pitch to get to Johnstown, PA. Each week, team members were responsible for emailing possible donors with a link to the specially designed webpage, asking for their support. This required a large time investment from each team member, but the effort paid off. As a whole, the team was able to raise \$5000 towards their competition expenses, enough to send them off to Johnstown.

Team co-captain Stuart Kretzschmar, who spearheaded the USEED effort this past spring was extremely pleased with how well USEED "allowed us to show how much we care about this team and gave us a way to restart our relationship with past team members and alumni. In the end, the campaign was a huge success."

If you would like to support the 2014-15 team, please contact Nigel Lyons at uwconcretecanoe@gmail.com. ■