

# The **Bridge**

## New Course in Renewable Energy Infrastructure Builds on Department Strengths

Three major trends have sparked the creation of a new course and a possible online program that relate to renewable energy infrastructure. These trends are global climate change, expanding activity in the renewable energy sector, and the department's focus on graduate level education.

Professors Tim Larson and Joe Mahoney developed and taught an on-campus graduate level course titled "Energy and the Environment" during the 2010 winter quarter. The course addressed mostly electrical production for all major types of generation (coal-fired to nuclear to renewables) with a focus on site selection, permitting, and construction. The primary focus was renewable energy production via wind, solar, and geothermal. Next up in the development process will be an online version of the course to be taught this summer. "This educational direction is exciting on many levels but one stands out—the integration of different disciplines and specialties within one course," Larson said.

At the University of Washington, CEE is well known for its outstanding departmental research on various aspects of climate change. The new courses will complement this strength by going beyond understanding the factors that drive climate change to address the questions associated with "What are we going to do about it?"

This we know—about 70% of CO2 generated in the US comes from two major sources—coal-fired power plants and transportation's use of hydrocarbon fuels. A shift toward lower carbon emissions is under way in Washington State, nationally, and worldwide. One prominent domestic example of this shift is a major upswing in the construction and operation of wind farms and solar projects. Washington State now has about 2,000 MW of wind generation



*Wild Horse Wind and Solar Facility in Central Washington (photos courtesy of Puget Sound Energy).*

capacity and is adding more. The state with the most wind capacity is Texas at 9,500 MW (hard to beat those winds in the Panhandle) and the US as a whole is at 36,000 MW. The US capacity is equivalent to about 36 1,000-MW nuclear power plants. Wind capacity in the US expanded by more than 10,000 MW in 2009, although recent (2010) capacity additions are far lower.

Naturally, renewable energy is not yet able to provide base load power (as can coal, nuclear, and natural gas power plants). Typically, about one-third of the capacity of a wind farm is useable electricity.

In the Northwest and the Seattle area specifically, we are unusual in how little fossil fuel we use to generate electricity. Hydro power is the source of about 89% of Seattle City Light's energy generation. ■



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## Message from the Chair

Greg Miller

I recently spoke with a graduating MSCE student who earned his BSCE at Illinois, the current #1-ranked CEE department in the US. Prior to beginning his degree work at the UW he had some concerns about what his experience might be like at another institution after going through the official top program in the country. As it turned out, he was “blown away” by the quality of the program, the faculty, and his fellow students at the UW, and he was completely pleased with his CEE experience.

This anecdote confirms that we can continue to be proud of the quality of the work here, which is a tradition we all strive to maintain. The counterpart to quality, of course, is quantity. It may seem strange to think about growth in the face of unprecedented budget cuts, but critical times tend to force different thinking than in normal times, and these times are not normal. It is worth taking a look at some long-term and short-term trends for UW engineering programs, and CEE in particular.

A plot of annual BS degrees granted across the College of Engineering from 1979 to the present shows an essentially flat curve with no growth in our overall capacity to enroll students. Within CEE, our capacity has decreased as other engineering disciplines have grown, so we have been part of an overall zero-sum game. Given state population increases since 1979 (about 50% statewide) and the current interest in infrastructure and the environment, it's not surprising to find pent-up demand and opportunity for growth in our program. Our recent round of undergraduate admissions drew 279 applicants for 115 slots; we had to turn away many qualified students, which should not have to be the case at a public university.

We find the same trend in applications data for graduate programs, making emphatically clear the high demand for growth in our educational enterprise. So how do we grow? It is conceptually

*Continues on back cover.*

## CEE STAR Lab a Tour Destination for the NATMEC 2010 Conference

CEE's STAR Lab — the Smart Transportation Applications and Research Laboratory — shined as the technical tour destination for the 2010 North America Travel Monitoring Exposition and Conference (NATMEC 2010). More than 50 people visited the STAR Lab during the June 21–24 conference. In addition to visitors from North America, the STAR Lab also received two international delegations in June and July, one from China and the other from Europe.



*STAR Lab students and faculty.*

The lab demonstrated cutting-edge technologies for data collection and interdisciplinary data sharing and modeling. Visitors showed great interest in STAR Lab research and offered valuable comments for further research directions.

The STAR Lab was established in 2003 by CEE and Transportation Northwest (TransNow), USDOT University Center for Federal Region 10, to enhance the strength of Institute of Transportation Engineers (ITS) research and education at the UW. It explores effective solutions to transportation problems and provides hands-on training instruments and software applications for students in ITS classes. ■

## Welcome to Kojay Pan, CEE Administrator

Kojay came to CEE in June 2010 from the Office of Minority Affairs and Diversity. Kojay received both his undergraduate and graduate degrees from the UW and was excited to return to his alma mater in 2008 after serving seven years as a budget director at Seattle University. Kojay and wife (Priti Mody-Pan, who works in the College of Engineering) have two young children, Elina and Kiran, ages 4 and 2. Kojay enjoys reading, basketball, tennis, and cycling. ■

## Oil and Public Policy Discussed at Third Annual Wenk Lecture

The audience was riveted when Dale Jensen, program manager for the state Department of Ecology's Spill Prevention, Preparedness and Response Program, spoke at the third annual Edward Wenk, Jr. Endowed Lectureship in Technology and Public Policy.

Every oil spill presents an opportunity to develop strategies that change public perception, technology, and ultimately public policy. Jensen's lecture began with a high-level review of the history of oil spills in

Every oil spill presents an opportunity to develop strategies that change public perception, technology, and ultimately public policy.

Washington and around the nation and how they have shaped public policy on environmental protection. He also spoke about the recent *Deepwater Horizon* oil spill in the Gulf of Mexico. Jensen outlined the public policy challenges facing environmentalists, tribes, industry, and government bodies in Washington State and discussed the importance of collaborative relationships as the basis for dealing with an oil spill and formulating a long-term

approach to managing oil spill issues. Jensen explained how the state has struck a balance with competing values in setting public policy on oil spill issues. Notes from this lecture are posted at: [www.ce.washington.edu/about/events/events.html#Wenk](http://www.ce.washington.edu/about/events/events.html#Wenk). ■



From left: Dale Jensen (speaker), Betty Wagner, Greg Miller, and Ed Wenk (seated).

## Jessica Lundquist Travels in Fast and Creative Company

Jessica Lundquist, assistant professor of hydrology and climatology, sure captured the imagination of the folks at *Fast Company*, a business magazine reporting on innovation, digital media, technology, change management, leadership, design, and social responsibility. She made the 2010 list of the magazine's "100 Most Creative People" — an eclectic take on the "breadth of new ideas and new pursuits at play in our business landscape."

Lundquist, ranking #99, shares honors with Qi Lu (#10), president of Online Services, Microsoft, and Lady Gaga, topping the list at #1, plus corporate CEOs, high-tech entrepreneurs, scientists, filmmakers, and chefs.

### Here's how Lundquist intrigued *Fast Company*:

"Cut a slit in a tennis ball and fill it with beans and small rocks." That's Jessica Lundquist's first step to creating a \$30 version of a \$10,000 scientific weather station.

Think of snowmelt as the Brita pitcher for 40% of the world's population, and it's trickling dry in more places given climate change. Sophisticated temperature data collected in rugged terrain are needed to model what will happen to water supplies. Lundquist, 33, who grew up hiking in California's Sierra Nevadas, brings a sense of fun to this serious work. Her hack — sticking a grocery-store temperature sensor into a tennis ball and launching it high into trees with the doohickey that people use to toss balls to golden retrievers — provides valuable data for up to 11 months, saves money, and captures the imagination. — Anya Kamenetz



Read more at: <http://www.fastcompany.com/100/> ■

## Faculty–Student Team Develops New Method to Accelerate Bridge Construction

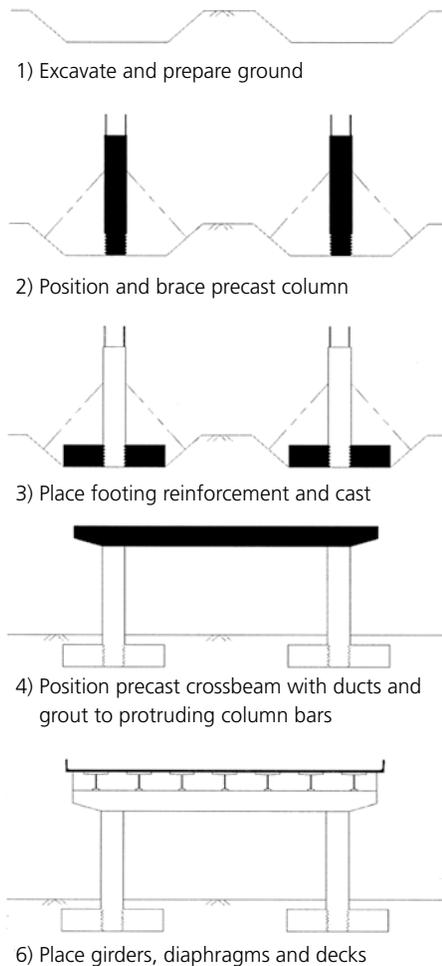
The bad news is that traffic delays due to construction are getting worse. The good news is that UW civil engineers are doing something about it. CEE graduate students Olafur Haraldsson, Todd Janes, and Hung Viet Tran are working with Professors John Stanton and Marc Eberhard on ways to speed up the construction of bridges. Their goal is to reduce highway lane closures and minimize disruptions when a bridge has to be replaced or a new one needs to be built.

The team is investigating ways to increase the use of prefabricated concrete so that large pieces can be brought to site and connected quickly. This strategy is routine for the long girders that form the bridge superstructure, but the substructure (the columns

projecting from the top, so is easy to handle and transport. The footing reinforcement is placed and the footing is cast around the column. The precast cross beam is then lowered over the column bars, which fit into matching ducts in the cross beam, and the

The footing connection is new, simple to construct, and allows almost infinite site adjustment.

Figure 1. Rapid construction sequence



and cross beams that support the long girders) are traditionally cast in place. This casting takes time because forms must be built, reinforcement tied, and the concrete must be poured and allowed to strengthen before the next step. The primary difficulty with precasting is that the site-made connections need to occur where the seismic forces are the greatest. Satisfying those competing demands creates a difficult challenge.

The team has been developing a series of connection details to solve the problem by combining the generous tolerances and easy fit-up that contractors demand during construction with the good seismic performance that is essential in the Puget Sound region. After the foundation is excavated, a precast concrete column is erected and braced (Figure 1). It has no reinforcement projecting laterally from the bottom, but has straight bars

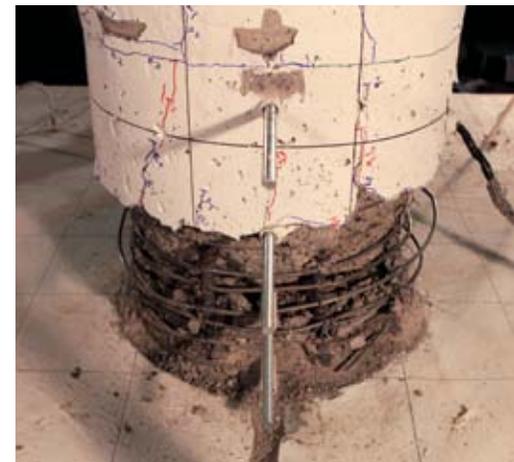


Figure 2. Failed column, unscathed footing.

ducts are grouted to anchor the column bars. The remainder of the construction process, such as erecting the long precast girders, proceeds as at present.

The footing connection is new, simple to construct, and allows almost infinite site adjustment. The major question is whether the forces can be transmitted from the column to

## Awards and Accolades

### CEE Teams Take 1st Place at ITE Student Night

Two CEE teams including transportation students Jonathan Corey, Felipe Sandoval, Tim Thomson, and Yunteng Lao tied for first place in the 2010 Washington Section ITE Student Presentation Competition held May 11. This year's project, provided by the City of Redmond, entailed conducting a safety analysis and identifying conceptual improvements of the 166th Avenue NE corridor between NE 85th Street and NE 100th Street. Presentations included a poster session and PowerPoint presentation.

### CEE Graduate Student Awarded EPA STAR Fellowship

Christine Fagnant, CEE PhD student in environmental engineering working with Assistant Professor Mike Dodd, was awarded the 2010 EPA Science To Achieve Results (STAR) fellowship. This fellowship is awarded through a rigorous review process and is intended to help defray the ever-increasing costs associated with studies leading to advanced degrees in environmental sciences.

### CEE Alumna Is "Inspiring Engineer"

Erin Fletcher (MSCE 2006), was recognized by the American Society of Civil Engineers (ASCE) as an "Inspiring Engineer" for her work in transportation engineering. Erin's fascination with the 1940 collapse of the Tacoma Narrows Bridge sparked her interest in civil engineering. Read Erin's story at: <http://content.asce.org/asceville/index.html>.

### David Stahl Wins NSF Biodiversity Grant

David Stahl, professor of environmental engineering, received one of 14 NSF grants to study dimensions of Earth's biodiversity. Prof. Stahl received the grant for his proposal titled "Significance of nitrification in shaping planktonic biodiversity in the ocean." He will use the grant to examine the diversity and function of ammonia oxidizing Archaea (AOA) and determine the role of these newly discovered organisms in structuring the diversity of phytoplankton.

### Charles Roeder Doubles Up on Awards

Charles Roeder, professor of structural engineering, won the 2010 American Society of Civil Engineers (ASCE) Ernest E. Howard Award, which recognizes a member of ASCE for contributing to the advancement of structural engineering through research, planning, design or construction. Prof. Roeder also will receive the 2011 American Institute of Steel Construction (AISC) T.R. Higgins Award at the institute's conference in May. He is being honored for his paper "Gusset Plate Connections for Seismic Design." The Higgins award recognizes a lecturer and author whose technical paper or papers are considered an outstanding contribution to the engineering literature on fabricated structural steel.



Team Members (L-R): Prof. Marc Eberhard, engineering technician Vince Chaijaroen, graduate students Todd Janes and Olafur Haraldsson, and Prof. John Stanton.

the footing when the only connection between the two is through the roughened concrete surface of the column. Testing of components has shown that the connection can easily sustain the seismic loads, and that the vertical load capacity is at least four times the largest vertical load that will occur. Figure 2 shows

... performance... is expected to exceed that of conventional cast-in-place construction, while still maintaining the benefits of rapid construction.

one of the test specimens after failure: as hoped, the failure occurred in the column at a very high load, while the critical connection region in the footing remained unscathed.

At the top of the column, the bars are fitted into ducts in the cross beam. To minimize alignment difficulties, the team used the largest available bars (#18) to allow the largest possible duct diameter. A series of pullout tests showed that bars grouted into ducts require a much shorter anchorage length and can easily be accommodated within the depth of the

cross beam. Further tests on the complete connection showed performance at least as good as that associated with conventional cast-in-place construction.

Work is continuing to extend these ideas to provide seismic performance that is expected to exceed that of conventional

cast-in-place construction, while still maintaining the benefits of rapid construction.

The critical tests were completed in February 2010. The team worked closely with Washington State DOT, which has just let a contract to build a bridge over I-5 using the technology. Nine months from research to implementation? That is rapid construction!

*The work has been supported by WS-DOT, FHWA's Highways for Life program, the PEER center, TransNOW and the Valle Foundation. ■*

## An A++ Alumnus: Argyle Armstrong's Legacy Keeps on Building

As a civil engineering student in the 1940s, Argyle Armstrong mapped the campus; as a construction engineer he left his imprint all across the state. Now, 20 years after his passing, his planned gift legacy will further the education of current and future students.

Inspired by a love of concrete work and construction, and a commitment to help students achieve the uninterrupted education not possible for him, Armstrong in

**Argyle built hospitals, reservoirs, a highway maintenance facility at Snoqualmie Pass, and a microwave tower at Mission Ridge Ski Area.**

1990 established plans for the Argyle E. and M. Patricia Armstrong Endowed Fund for Civil Engineering. Last spring the department received Argyle and Patricia's generous gift. Their endowed discretionary fund for academic support will benefit CEE for years to come.

"I am always encouraged by alumni who give back to their department," said Greg Miller, CEE chair. "The

benefit of discretionary funding is that we can use it to meet a pressing academic need or special opportunity that other designated funds do not allow."

A partner and former owner of Wenatchee-based Armstrong & Armstrong Construction, a family business, Argyle built hospitals, reservoirs, schools, a highway maintenance facility at Snoqualmie Pass, and a microwave tower at Mission Ridge Ski Area. "My dad loved his work," said Carol Golden of Spokane, Armstrong's youngest daughter, "He created all his own drawings, worked into the night, and was involved in every aspect of his projects. Wherever the job was, my dad would pull his trailer there and stay there all week," she remembered.

His oldest daughter, Joan Kinney, shared Armstrong's interest in civil engineering and also graduated from UW CEE as the only female member of her class. They both took classes from Professor Fred Rhodes.

"My father started and stopped his engineering education several times. He entered the University of Washington in 1932, and was required to take ROTC. His unit was later called for active duty overseas and he spent 43 months in the South Pacific. He entered the Army as a private, and came out as a major, she said.

Joan's parents met at the UW—he studied civil engineering, she majored in home economics—and married in 1941 while Argyle was in the Army. Joan was born in 1942.



Twenty years after his passing, Armstrong's planned gift legacy will further the education of current and future students.

Argyle returned home in November 1945 and finished his civil engineering degree, graduating in 1947. He started Armstrong & Armstrong with his father and brother and lived in Wenatchee, Okanogan, and Omak.

Argyle's son Glen remembers that his dad was a hard worker and a phenomenal surveyor. According to Glen, his father misunderstood a UW class assignment and thought that he only had one week to survey the entire campus. Argyle did such a thorough job that his results were used as a campus map for many years. ■

## First Berg Professor Joins Faculty

Henry Roy Berg studied civil engineering at UW in the 1930s. When he passed away in 1985, he included the department in his estate with a provision that the endowment could evolve into a professorship when it met the minimum funding requirement, a status approved by the UW Regents in spring 2009.

Berg's generosity and foresight enabled CEE to recruit an outstanding geotechnical engineer. After ten years at Drexel University, Joseph Wartman joined the UW faculty in autumn quarter as the H.R. Berg Associate Professor of Civil and Environmental Engineering.

Among his honors is a National Science Foundation Early Career Award. He is a specialist in earthquakes, natural hazards, and sustainable geotechnics, and edits the *Journal of Geotechnical and Geoenvironmental Engineering*. He earned his doctorate at UC-Berkeley, and his BSCE at Villanova. Visit: [http://www.ce.washington.edu/people/faculty/bios/wartman\\_j.html](http://www.ce.washington.edu/people/faculty/bios/wartman_j.html) ■

## Bob Card Got the Gold at the 2010 COE Lecture Series

Speaking to a packed crowd of more than 700 people, Bob Card (BSCE '72), president, Facilities and Infrastructure Division, CH2M Hill, impressed the audience with stories regarding the



*Below: Olympic Stadium. Right: Bob Card.*



engineering of the 2012 Olympics in London — billed as the greenest games ever. Bob was the chief operating officer for the British-American consortium constructing the multibillion-dollar Olympic Park facility. Their work is creating an all-new sustainable city on the outskirts of London and has revitalized an entire community. You can watch on UW TV — please check local listings, or visit the UWTV website: <http://www.uwv.org/programs/displayevent.aspx?rID=32646&fID=7107> ■

## 65 Years and Going Strong!

Department chair **Greg Miller** and **Dean Matt O'Donnell** joined the class of 1945 for their 65th year reunion at **Alan** and **Inger Osberg's** home in August. **Larry Johnson**, **Robert Lindberg**, **George Shanafelt**, and **Theodore Dec** were on hand to share stories of their time in More Hall. Three other classmates, **Joe Penzien**, **John Robertson**, and **Alex Candoo** were unable to attend and were missed greatly by the group. As they have done every five years, the group lined up at the swimming pool for their commemorative photograph — don't they look great!

Have you had your own class reunion lately? If you would like to share photos and information, please contact Megan Ingram at (206) 685-1378 or [mkingram@u.washington.edu](mailto:mkingram@u.washington.edu).



*Standing (L-R): Alan Osberg, Larry Johnson, Greg Miller.  
Seated (L-R): Theodore Dec, Robert Lindberg, George Shanafelt,  
Matt O'Donnell.*

## The Bridge

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# The Bridge

## Awards and Accolades *(continued from page 5)*



*Dean Chahim (far right) helps local workers repair a road in a remote area of Bolivia.*

### CEE Undergrad "Making a Difference"

Dean Chahim, CEE junior, was recently featured in the "Making a Difference" section of UW alumni magazine *Columns* (Sept. 2010, pg 34) for his work repairing rural roads in Bolivia with Engineers Without Borders. Closer to home, he volunteers his time to raise awareness about dirty water wells near Yakima.

### Stephen Muench Promoted

Stephen Muench was promoted to associate professor in CEE beginning with the 2010–11 academic year. Steve specializes in construction engineering and is becoming well known for his "Greenroads" project, which provides a sustainability performance metric for roadway design and construction. Please visit [www.greenroads.us](http://www.greenroads.us) for more information on the rating system. ■

## Chair's Message

*(continued from page 2)*

simple: hire additional faculty and staff, expand our facilities, and enroll additional students. Unfortunately, the first two pieces require investment, and we must coordinate all three components or program quality will suffer. Waiting for traditional state funding is like waiting for Godot, and it is evident that we require new thinking and new models to enable us to meet the needs of the profession in the future.

I have been working with campus and alumni leaders to identify funding and revenue models that can allow us to handle increased demand. As alumni, parents, and professionals, we all have a stake in this, so I will keep you informed on progress and welcome your input. This will be a long-term effort, and with the right partnerships and vision, I am confident we can move the CEE program into its next phase of education and service at an appropriate scale for the state's and nation's needs. We're not living in 1979 any more. ■