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University of California, Los Angeles

Civil and Environmental Engineering at UCLA

Vol. 7, No. 2

Spring 2008

Engineering Sustainable Infrastructure for the Future

Chair's Message

J.S. Chen

This newsletter edition showcases the tremendous faculty achievement and scholarship that we have come to expect in recent years. I will let the contents speak for themselves, but I do want to single-out **Bill Yeh** *for his recent election to the National Academy of Engineering. As many of you know, for decades Bill has been a titan in the field of groundwater hydrology, and in particular the modeling of solute transport in groundwater and the optimization of water resources systems. This is a richly deserved, seminal honor for a man who remains at the height of intellectual influence and productivity in his disciplines. As you might expect, we are exceedingly proud of our colleague and friend. Congratulations Bill!*

I also want to congratulate **Steve Margulis** *and* **Eric Hoek** *for their promotions to Associate Professor with tenure. Both of them should be familiar to regular readers of this newsletter. Steve's research focuses on surface hydrology, hydrometeorology, remote sensing, and data assimilation, while Eric's research interests include membranes, desalination and advanced water treatment, nanotechnology and nanotoxicology. You can obtain detailed information about their work and that of our entire faculty at http://cee.ucla.edu/cgi-bin/faculty.php.*

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Yeh Elected to NAE

William W-G. Yeh, Distinguished Professor of Civil and Environmental Engineering at UCLA, is one of 65 U.S. members and nine foreign associates elected to the National Academy of Engineering on February 8, 2008.

Photo by Don Liebig

NAE election is one of the highest professional distinctions conferred upon individuals from any of the engineering disciplines. The academy, established in 1964, honors those who have made "outstanding contributions to engineering research, practice, or education." Academy members invariably have contributed significantly to the engineering literature, pioneered new and emerging fields of technology, advanced traditional fields of engineering, and/or developed innovative approaches to engineering education. There are fewer than 2500 NAE members in the world.

Prof. Yeh was elected for his extensive work developing optimization methodologies – now used worldwide – for water resources management and inverse methods in subsurface flow modeling. He pioneered research on large-scale optimization models that utilize systems analysis techniques to plan, manage, and operate several of the U.S.' water resources systems. The methodology and algorithms he established for the real-time operation of complex, multi-purpose, multiple-reservoir systems have been adopted in the U.S. and elsewhere, including Brazil, Canada, South Korea, Taiwan, and China. In addition, Yeh founded the field of inverse modeling in subsurface hydrology and led the effort to develop nonlinear inverse algorithms for parameter identification in groundwater hydrology. The algorithms now are used widely in groundwater modeling practice.

Yeh's body of work has earned numerous national and international distinctions. In 1989 he received the American Geophysical Union's Robert E. Horton Award (now known as the Hydrological Sciences Award) for "distinguished contributions and leadership in water resources systems, hydrologic modeling, and particularly groundwater hydrology." In 1993 he was elected a Fellow of AGU "in recognition of unselfish dedication and scholarly contributions to the hydrological sciences." In 1994 Yeh won the American Society of Civil Engineers' Julian Hinds Award for "many contributions to

See Yeh, page 2

Symposium to Honor Yeh

See page 3

ASCE Concrete Canoe & Steel Bridge Teams Earn Bids To National Competitions *See ASCE News, p. 7*

Faculty News

Sabol Wins ASCE Award

Adjunct Professor Thomas Sabol is the recipient of the 2008 ASCE George Winter Award. The award recognizes the achievements of a structural engineer researcher, educator or practitioner who best typifies a humanistic approach to the profession. In addition to an honorarium and medal, Sabol's award citation specifically commends "his contributions as a practitioner, code developer and educator in the area of seismic design steel structures and his work to improve his local community through church activities."

Sabol is the tenth recipient of this honor since its institution by ASCE in 1990. He is the previous winner of the Henry Samueli School of Engineering and Applied Science Professional Achievement Award (2004) and the Structural Engineers Association of Southern California Engineer of the Year Award (2003).

For more about the George Winter Award, go to http://www.asce.org/pressroom/honors/honors_details.cfm?hdlid=77. *To read about Dr. Sabol's previous awards, see the fall 2003 and fall 2004 C&EE newsletters at* http://cee.ucla.edu/cgi-bin/newsletters.php.

Stewart Back in Europe

Professor Jonathan Stewart has returned to Europe for a sabbatical in Italy and Greece from April-July 2008. In Italy he is teaching an advanced course on geotechnical earthquake engineering at the Rose School in Pavia. Rose offers MS and PhD programs in earthquake engineering for international students (most are from elsewhere in Europe). The program fills an important niche because, unlike California, earthquake engineering principles generally are not emphasized in European graduate programs.

In Greece Prof. Stewart will be collaborating with colleagues at the Institute of Engineering Seismology and Earthquake Engineering in Thessaloniki, with funding from the EU-sponsored Marie Curie Research Fellowship Program. The group's research goal is to improve models used for the prediction of earthquake ground motions in Greece. The effort builds upon similar, successful work recently completed in Italy, where Stewart collaborated with Prof. Giuseppe Lanzo and PhD student Giuseppe Scasserra, among others.

*Learn about the Fulbright Lecturing award that funded Prof. Stewart's first sabbatical to Europe in the spring 2004 C&EE newsletter; read Stewart's impressions of that sabbatical in the spring 2005 newsletter (*http://cee.ucla.edu/cgi-bin/newsletters.php*).*

In Other News....

In March 2008 Professor Woody Ju was appointed as an Editorial Board member of *Acta Mechanica*, a premier journal in the field of applied mechanics. He also organized a Symposium on Multiscale Damage and Failure Mechanics of Engineering Materials at the May 2008 ASCE Engineering Mechanics Conference at the Univ. of Minnesota.

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Associate Professor Ertugrul Taciroglu has begun a three-year term as an Associate Editor of the ASCE *Journal of Structural Engineering*, the most prominent publication of the structural engineering discipline.

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Caltrans-funded research conducted by Assistant Professor Scott Brandenberg and nees@UCLA operations manager Robert Nigbor was profiled in the February 2008 issue of *Civil Engineering* magazine. The work involves the monitoring of construction vibrations and their potential to induce differential settlements in soils in the delta area of the San Joaquin and Sacramento rivers, potentially blurring the relation between archeological history and geologic history at certain locations. To view the article, go to *http://pubs.asce.org/magazines/CEMag/2008/*.

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The April 2008 issue of the e-newsletter *Impact* devotes itself to research across the UCLA community on mitigating the effects of natural disasters. Featured work includes Prof. John Wallace's project on seismic rehabilitation of hospital structures, as well as the collaboration of Assistant Professors Terri Hogue and Jenny Jay on post-wildfire effects on downstream water supplies. To view the e-newsletter, go to *www.spotlight.ucla.edu/impact/archives/*. Hogue and Jay's work is also the subject of an article in the spring 2008 issue of *UCLA Engineer* magazine. View the article at *www.engineer.ucla.edu/magazine/UEsp08.pdf*.

Yeh

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research and teaching in water resources planning and management and to water resources engineering practice, particularly in the areas of hydrological and hydrodynamic modeling and optimization of large-scale water resources sytems." ASCE elected him as a Fellow in 1994 and awarded him Honorary Membership in 1996 for his "distinguished career as a scholar in education and private practice in the fields of water resources engineering and groundwater hydrology." In 1999 he received the Warren A. Hall Medal from the Universities Council on Water Resources for his "unusual accomplishments and distinction in the water resources field."

Yeh has further dedicated himself to the profession through service to ASCE and AGU, most notably as editor of ASCE's *Journal of Water Resources Planning and Management* (1988-1993). Since joining UCLA in 1967, he also has served the university and faculty in many capacities, including twice as C&EE Dept. Chair (1985-1988, 2002-2007). Finally, to date he has mentored and graduated 48 PhD students, most of whom are now successful teachers, researchers, and practicing engineers at universities, public agencies and private firms in the U.S. and abroad.

Prof. Yeh will be inducted formally as a member at NAE's Annual Meeting in Washington, D.C. on October 5.

To view the NAE press release about member election, go to http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=02082008. *To view a UCLA press release, go to* http://cee.ucla.edu/cgi-bin/news.php?nid=35.

Major NSF Grant Awarded

Assistant Professor Terri Hogue is co-Principal Investigator on a recently awarded five-year, $3 million NSF GK-12 Graduate Teaching Fellows in K-12 Education (GK-12) grant aimed at the professional development of Science Technology Engineering and Mathematics (STEM) graduate students at UCLA. With GK-12 funding the investigators have established the Science and Engineering of the Environment of Los Angeles (SEE-LA) program, which is partnering with both the L.A. Unified School District and the Culver City Unified School District to address diverse environmental problems in the metropolitan region. The SEE-LA program involves the integration of STEM graduate students, serving as "science advisors," into middle and high schools to work with master teachers and improve their own communication and pedagogy skills. The grad students will develop science lessons, stand as a resource in the classroom and school, and facilitate middle/high school interaction with the UCLA campus, enriching the learning experiences of over 6000 urban students.

Prof. Hogue and her collaborators (including PI Mark Moldwin, a UCLA space physics professor, and co-PI Peter Nonacs, a UCLA ecology and evolutionary biology professor) will oversee the professional training of 50 science and engineering graduate students and, specifically, advance their ability to connect their research across disciplines, communicate scientific research to non-scientists by preparing and teaching discovery-based lessons, and participate in science teacher professional enhancement activities. The program selected its first group of GK-12 fellows for the 2008-2009 year and will conduct workshops this summer to initiate teacher-fellow partnerships and curriculum development.

For more information, visit the SEE-LA GK-12 website at *http://measure.igpp.ucla.edu/GK12-SEE-LA/*.

In honor of his career achievements, UCLA will host a special symposium

Water Resources Systems Analysis: The Contributions of William Yeh

December 12-13, 2008

The two-day gathering will feature addresses by 14 internationally renowned scholars from the hydrology and water resources engineering disciplines, including five members of the National Academy of Engineering. The first day will conclude with a celebratory dinner reception.

The symposium will be co-convened by former William Yeh doctoral graduates Miguel Mariño (1972), Tracy Nishikawa (1988), and Mario Putti (1989); as well as current C&EE faculty Terri Hogue, Steve Margulis, and Michael Stenstrom

To view an agenda and attend the symposium, please go to the registration link on the C&EE web site main page (www.cee.ucla.edu)

For further information, please contact Terri Hogue at thogue@seas.ucla.edu

Stewart Wins Huber Prize

C&EE professor and Vice Chair Jonathan Stewart is a winner of the 2008 Walter L. Huber Civil Engineering Research Prize. Established in 1946 by the American Society of Civil Engineers and endowed in honor of past ASCE president Walter Huber in 1964, the annual prize recognizes notable achievements in research across all the civil engineering disciplines, with preference to younger researchers of early accomplishment, and consists of a certificate and cash award.

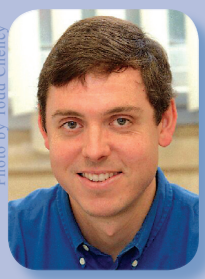

Photo by Todd Chency

The award citation praises Stewart "for research in geotechnical and earthquake engineering, with particular emphasis on soil-structure interaction, site effects on ground motions, and seismic ground failure of unsaturated soil." The selection committee particularly noted his development of practical models for analysis of important seismic phenomena that were largely ignored in years past. Moreover, his research findings have been incorporated into national design standards (including ASCE-41, FEMA-440 and the NEHRP Provisions for the Seismic Design of New Buildings), benefiting civil engineering practice through more realistic characterizations of seismic hazards.

Prof. Stewart is the eighth C&EE faculty member to receive the prestigious Huber Prize, an impressive lineage of accomplishment that includes current Professors Keith Stolzenbach (1979), Michael Stenstrom (1981) and Woody Ju (1997). Among Stewart's previous awards are the Shamsher Prakash Research Award (2006), a lecturing award under the Fulbright Scholarship program (2005), a Northrop Grumman Excellence in Teaching Award (2003), ASCE's Arthur Casagrande Professional Development Award (2001), and a NSF Faculty Career Development award (1998).

To learn more about the Huber Prize, go to www.asce.org/pressroom/honors/honors_details.cfm?hdlid=34. *Read more about Stewart's recent awards in the fall 2006, spring 2004, and spring 2003 C&EE newsletters at* http://cee.ucla.edu/cgi-bin/newsletters.php.

Chair

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As I reported in the previous newsletter, in the fall quarter Prof. Ted Belytschko of Northwestern University delivered the inaugural lecture of our newly established Distinguished Lecture Series in Structural Engineering and Mechanics, generously sponsored by Livermore Software Technology Corp. The series continued in the spring quarter with two lectures, one by Prof. Wing Kam Liu, also of Northwestern, on "Multiresolution Mathematical Analysis Framework – Integrated Materials Design to Molecular Bio-Regenerative Engineering;" and the other by Prof. Robert Taylor of UC Berkeley on "The Finite Element Method: A Half Century of Progress." All three lectures were very well received and set an excellent standard as the series continues next academic year.

In February the department convened with its Industry Advisory Board, a collection of distinguished industry representatives and scholars from outside the UCLA community (including four NAE members) who counsel us in the setting of priorities and pursuit of goals. A full day of reviews and discussions focused on all aspects of our program, including curriculum, research activity, faculty recruiting, student enrollment, and industry needs. To learn more about our IAB and read its report of recommendations and conclusions, go to http://cee.ucla.edu/cgi-bin/iab.php.

It is noteworthy that by summertime our ASCE student chapter will have qualified for and competed in not one, but three national competitions this year. This impressive feat signifies tangible chapter maturation, cohesion and dedication that set a precedent for future ASCE activities. Please join me in applauding the chapter, and read more about its accomplishments in these pages.

At the same time, we are taking a more active role in the progress of our students. At the department level we have begun instituting a new Samueli School-wide program of informing and supporting undergraduates through meetings with faculty advisors at key point during their UCLA experience. While C&EE students will continue to interact with the school's Office of Academic and Student Affairs regarding the basics of course planning and degree requirements, they now will

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Evaluating Bridge Fragility in Liquefied and Laterally Spreading Ground

Earthquakes have damaged bridges throughout the world, impeding traffic flow during critical post-earthquake recovery efforts, disrupting commerce and causing billions of dollars in economic losses. Bridges are vital links in our transportation infrastructure, and perhaps are needed most following earthquakes when emergency vehicles require immediate access to affected areas. Bridges have been particularly susceptible in areas where soil liquefaction occurs. Liquefaction is the dramatic loss of shear strength suffered by saturated loose sandy soil due to buildup of water pressure in the soil pore space, and can be associated with lateral ground deformation known as lateral spreading. Bridges that cross bodies of water often are founded in geologically young, loose liquefiable soils that slope toward the water channel and are prone to lateral spreading. Furthermore, bridges begin and end on unsaturated ground above the water table, and a notably damaging scenario arises when this unsaturated, relatively strong non-liquefied soil spreads laterally against bridge components atop underlying liquefied ground.

Two views of a collapsed segment of the Nishinomiya Bridge due to soil liquefaction and lateral spreading after the 1995 earthquake that struck Kobe, Japan.

Bridges founded in soil deposits that liquefied and spread laterally during prior earthquakes have exhibited responses ranging from minor damage, with the structure remaining in service immediately after the seismic event, to complete collapse, with months or years needed for repairs. Understanding the combinations of geologic and structural conditions that result in various levels of damage is critical for planning post-earthquake emergency response, assessing the existing hazard and prioritizing prospective retrofit efforts.

The California Department of Transportation (Caltrans) owns more than 12,000 bridges consisting of various structural configurations and construction material types, different vintages that reflect the evolution of design codes over time, and founded in soil profiles that possess varying levels of liquefaction susceptibility. Many of the bridges were constructed before landmark 1964 earthquakes in Niigata, Japan, and Alaska made engineers acutely aware of the potential destruction that can result from liquefaction. Moreover, the construction of most California bridges pre-dates a number of research studies over the past decade that have clarified the interaction between bridges and liquefied ground, so those bridges' design did not benefit from recent studies' findings. Since detailed evaluation of the entire bridge inventory by more recently developed analysis methods is impractical, Caltrans needs a screening tool for quickly identifying the types of bridges that are most susceptible to liquefaction-induced damage.

In September 2006 C&EE Assistant Professors Scott J. Brandenberg and Jian Zhang initiated a Caltrans-funded research project to identify combinations of structural configurations and soil conditions that render bridges vulnerable to liquefaction-induced lateral ground displacement. The cross-disciplinary collaboration combines Brandenberg's expertise in the behavior of bridge foundations in liquefied and laterally spreading ground with Zhang's expertise in the structural modeling of bridges. They are

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Bridge

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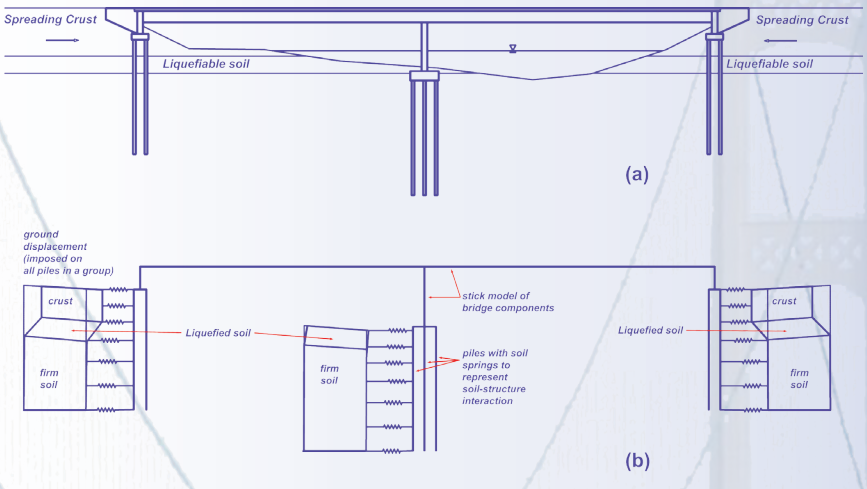
employing a performance-based earthquake engineering (PBEE) methodology that aims to improve decision-making about seismic risk by making both the choice of performance goals and the tradeoffs they entail apparent to facility owners and society at large. A critical component of PBEE is the quantification of risk so that decisions can be made based on probabilities of meeting or exceeding specific damage levels. PBEE has gained significant momentum in the past ten years because decision makers find it an attractive alternative to code-based prescriptive design methods that do not explicitly quantify risk. PBEE analyses often employ fragility functions that relate structural damage to some earthquake intensity measure (e.g., peak ground acceleration or lateral spreading displacement) as model inputs. However, it has been shown that existing fragility functions for liquefaction and lateral spreading are excessively conservative and predict unrealistically widespread damage. The updated fragility functions developed by Brandenberg and Zhang will fit into an improved PBEE risk assessment methodology that uses state-of-the-art geographic information system (GIS) mapping of seismic hazard based on a bridge's proximity to active faults, combined with mapping of liquefaction and lateral spreading hazard based on geology and topography.

Graduate students in the Brandenberg and Zhang research group are performing numerical simulations that expose bridges of various vintages and structural configurations to liquefaction and lateral spreading conditions within a range of different soil profiles to capture the combinations of structural characteristics and soil properties that most influence bridge response. Their modeling bases structural properties and geometric configurations on available as-built bridge drawings, and soil properties on an extensive data set of soil investigations compiled by the U.S. Geological Survey. The group numerically simulates the structural properties of a bridge, including piers (columns), superstructure, abutments and pile foundations, and then imposes displacement demands on the bridge to simulate liquefaction-induced lateral spreading. Group members document the resulting deformations of and forces applied to the piers and piles, and assign damage states based on the recorded bridge response. For example, when a pier first begins to yield, a bridge transitions from a 'no damage' state to a 'minor damage' state. Further displacement will shift it from a 'minor damage' to a 'moderate damage' state and so on, eventually to collapse.



A schematic of a typical Caltrans bridge configuration founded in a liquefiable soil profile with lateral spreading potential (a), and a representation of a bridge's structural elements for assessing performance in the Brandenberg-Zhang numerical simulation domain (b).

Significant variations exist in the structural properties of bridges within a vintage as well as within soil profiles at bridge sites throughout California. Accordingly, in their models Professors Brandenberg and Zhang impose various combinations of structural properties, soil profiles and soil displacement patterns to capture the range of possible scenarios for real bridges. Adequately capturing a sufficient combination of input parameters requires repetition of thousands of simulations that sometimes require weeks to run on a computer. Once

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benefit from direct, mandatory, out-of-the-classroom contact with our faculty. The goal is to establish relationships and discuss the larger goals and strategies related to launching into a fulfilling career in civil or environmental engineering, and we fully endorse this effort.

Until the next newsletter and next academic year, please stay informed about our department's activities by visiting us at www.cee.ucla.edu.

Alumni News

An Associate Professor of Civil and Environmental Engineering at the Univ. of Nevada, Las Vegas, ***Thomas Piechota*** (PhD 1997) also is UNLV's new Director of Sustainability and Multidisciplinary Research. Among other things, in this capacity Prof. Piechota will advance the Urban Sustainability Initiative (http://urban21.unlv.edu). Its mission is to collaborate with community groups and find solutions for quality-of-life challenges confronting the Las Vegas metropolitan area, with anticipated implications for the southwest, the nation and beyond.

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Daniel Whang (PhD 2001) is a Senior Geotechnical Engineer at Geomatrix, a geotechnical and environmental engineering consulting firm in Newport Beach. He focuses primarily on large public works projects such as designing earth dams, landfills, and power plants; as well as forensic engineering. He and his wife Jeanne have two boys and are expecting their third child in October.

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On a year-long sabbatical from the Univ. of Padua in Italy, ***Mario Putti*** (PhD 1989) has been conducting research in residence at UCLA's C&EE Dept. He is collaborating with Prof. William Yeh on the optimization of the advanced storage and recovery processes of the Las Posas Groundwater Basin. While here Mario, his wife and three daughters have enjoyed, among other things, visiting Joshua Tree, Death Valley, Channel Islands, Grand Canyon, Yosemite, Grand Teton, and Yellowstone National Parks. His experience has been enhanced further by his sharing of office space with this newsletter's *esteemed* editor.

Group Conducts Field Work in Bangladesh

Jay and Collaborators Investigate Arsenic Mobilization

The presence of arsenic in groundwater in southwest Asia's Ganges Delta has precipitated the largest environmental poisoning in history; tens of millions of people in the region drink from dangerously contaminated groundwater sources. In Bangladesh, for example, an estimated 3000 people die from cancer induced by arsenic each year. Continued consumption of contaminated water there will increase the incidence of arsenicosis – encompassing a range of health hazards caused by prolonged arsenic exposure, including skin lesions, skin cancer, and blood and organ problems – to approximately two million cases per year. Despite the tragic public health implications of this problem, there is not yet a complete explanation of why dissolved arsenic concentrations are so high in Ganges Delta groundwater.

Chu-Ching Lin and Tiffany Lin assemble sensor equipment in Munshiganj, Bangladesh.

UC researchers have been collaborating with colleagues at MIT and the Bangladesh University of Engineering and Technology for the last three years to address this issue. Specifically, members of Assistant Professor Jenny Jay and Prof. Tom Harmon's (UC Merced) laboratories as well as UCLA's Center for Embedded Network Sensing (CENS) have been installing sensors in the subsurface of an experimental rice paddy in Munshiganj, Bangladesh to understand the chemistry. They are particularly interested in changes that may lead to the cycling (transport) of arsenic from solid minerals, where it is immobile, to groundwater where it can be pumped as drinking water. The temporally dense nature of the researchers' environmental sensing data allows the observation of processes previously undocumented at this or similar sites. Reproducible daily variations in geochemical parameters such as nitrate and ammonium indicate that diurnal, possibly plant-induced, changes in subsurface water chemistry may be important in arsenic mobilization to groundwater.

Following three field trips in 2006 and 2007 funded by a NSF Small Grant for Exploratory Research and CENS, the Jay group constructed laboratory microcosms at UCLA using sediment from the rice paddy and artificial irrigation groundwater containing arsenic in an effort to simulate the diurnal cycles previously observed at the field site. Researchers introduced air and a mixture of nitrogen and carbon dioxide into the microcosms in alternating time periods to create conditions of corresponding oxygen presence and absence. They also investigated the importance of microbial activity in driving the release of arsenic from the solid phase to water by adding external organic carbons, such as lactate and acetate, as food for the microbes in half of the microcosms, and by the use of 'killed controls' (eliminating microbial influences). Results showed that in carbon-amended treatments arsenic cycling can occur in a matter of days; previously only a seasonal pattern had been observed. This implies that oscillations in oxidative-reductive conditions in diurnal (and seasonal) time scales may be important in the mobilization of arsenic into aquifers.

In April 2008 Prof. Jay, PhD student Tiffany Lin and post-doctoral researcher Chu-Ching Lin traveled to Bangladesh. The group's major goal was to further investigate the diurnal trends in geochemical parameters by deploying sensors in subsurface areas, as well as to explore the importance of vegetation on the trends by deploying in both vegetated and non-vegetated areas, as diurnal cycles have been hypothesized to be induced mainly by plants. In addition, the group collected water samples throughout each day to observe arsenic trends, because arsenic data cannot be collected by sensors. They also embedded dedicated microsensors to additionally measure pH, dissolved oxygen, and oxidative-reductive potential. Since atmospheric oxygen can cause chemical reactions (something that would not occur normally in the subsurface), the Jay group developed a unique sampling method involving gas-tight syringes, plastic valves, and Teflon tubes in an effort to limit the water's atmospheric exposure. Results from the water samples show higher arsenic levels in vegetated areas versus non-vegetated areas and a decreasing trend throughout the daytime.

Prof. Jay and her colleagues' continuing work on the project involves further analysis of the diurnal trends observed by the sensors, as well as ongoing microcosm work with rice seedlings and sediment from the site. Her group and that of Prof. Charles Harvey (MIT) are in the first year of a three-year NSF-funded project to examine more fully the suspected causal mechanisms related to the arsenic cycling.

A link to more project photos is on Jenny Jay's research web page (http://cee.ucla.edu/cgi-bin/faculty.php?uid=19&fpg=2).

Simulation Method

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accomplished, the Brandenberg and Zhang group statistically interprets the analyses to obtain the mean and standard deviation of soil displacements required to mobilize various damage states. The resulting fragility functions are defined as the cumulative probability of meeting or exceeding a given damage state.

Scheduled to complete in fall 2008, the Brandenberg-Zhang project thus far has focused on older-vintage bridges that comprise the bulk of the Caltrans bridge inventory. Preliminary results indicate that older bridges are not as vulnerable to liquefaction and lateral spreading as predicted by already-published fragility functions, while newer bridges (still to be studied) and retrofitted bridges likely will perform even better. The results should translate into significant cost savings for Caltrans relative to retrofit expenditures based on existing, overly-conservative fragility functions. Moreover, in addition to Caltrans bridges, the Brandenberg-Zhang group has been validating its methodology by analyzing case histories of bridges outside California that have exhibited various levels of performance under liquefaction and lateral spreading during past earthquakes.

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Finally, though Caltrans engineers have used a screening procedure to identify bridges that are most likely vulnerable to ground shaking – leading to an extensive retrofit program to mitigate that specific hazard – the cross-benefits for the mitigation of lateral spreading remain unknown. Accordingly, the Brandenberg-Zhang group is assessing the extent to which structural characteristics that render a bridge vulnerable to ground shaking also expose it to liquefaction and lateral spreading. Preliminary analyses indicate bridges behave very differently under lateral spreading than under ground shaking, indicating that distinct retrofit measures may be required to mitigate these different hazards.

Early results from the study, presented at the International Conference on Urban Earthquake Engineering in Tokyo in March 2007, already constitute a contribution to the improvement of seismic risk assessment and performance-based earthquake engineering. Combined with results to follow, Professor Brandenberg and Zhang's collaborative approach will supply a valuable tool to state agencies and assist policymakers and other stakeholders as they contemplate the judicious allocation of resources for planning and preparing our transportation network for the next, inevitable earthquake.

Grad Student Awards

PhD student **Sonya Lopez** has won a fully funded, three-year NSF Graduate Research Fellowship. Sonya's proposed dissertation project, to be completed under faculty advisor Terri Hogue, examines the effects climate change will have on mercury mobilization to coastal wetlands over the next century. For more on the project, go to *www.seas.ucla.edu/~thogue/*.

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At the fall 2007 American Geophysical Union meeting in San Francisco two PhD students won separate Outstanding Student Paper Awards – **Bart Forman** for "Estimates of Total Downwelling Surface Radiation Using a High-resolution GOES-based Cloud Product along with MODIS and AIRS Products," and **Hsin-Yuan Huang** for "Influence of Surface Heterogeneity on a Realistic Convective Boundary Layer." Both collaborated with faculty advisor Steve Margulis on the respective projects.

ASCE News

Two academic quarters of hard work and dedication by UCLA's ASCE student chapter were well recognized at the annual ASCE Pacific Southwest Regional Conference (PSWRC), hosted by Cal State Northridge on April 3-5. Of the 18 represented universities participating in the traditional events – concrete canoe, steel bridge, surveying, concrete bowling, environmental design, and others – the UCLA chapter placed third overall, with five projects placing third or higher! Our concrete canoe team performed especially well, taking second place and earning the opportunity to compete at the 21st annual ASCE National Concrete Canoe Competition, to be held at the École de Technologie Supérieure in Montreal, Canada on June 19-21. Moreover, our vastly improved steel bridge team not only qualified at PSWRC for the first time in six years, but secured a bid to compete in the 2008 national competition at the University of Florida on May 23-24. In other awards, chapter president Peter Jonna won third place in the technical paper competition for his essay on infrastructure privatization, while Paulo Baltar earned second place for the concrete Frisbee team. Lauren Tomita led the concrete bowling ball team and Shoshana Bergeron and Ted Reinert led the environmental team to respective third place finishes. Given this year's fantastic results, returning members will have a high standard to meet, if not exceed, when they compete in next year's PSWRC at the Univ. of Hawaii, Manoa.

ASCE members with their seismic design entry in New Orleans

Our ASCE chapter takes advantage of community service opportunities whenever possible. In February, several ASCE members went to Palisades Charter High School to assist students in the MESA (Mathematics, Engineering, and Science Achievement) Program. Among other things they helped the students build their own competition projects, including a balsa wood bridge, manila folder bridge, catapult, balsa wood glider, and an egg-drop contraption. In March members of our mentorship program attended UCLA RollAIDS night, a student-run event on campus that involved roller-blading, glow sticks and live entertainment with the goal of raising money for AIDS orphans in Tanzania. In addition, an ASCE group participated in the ninth annual UCLA Run/Walk in April to benefit the UCLA Mattel Children's Hospital. Shortly after this event, five of our members road-tripped to Tijuana, Mexico to help Amor Ministries with the Baja House Project, an ongoing effort to build homes for needy families.

Concrete canoe team members enjoy a light moment after qualifying for national competition.

In other news, in February ASCE members competed in the national Seismic Design Competition in New Orleans. With its six-foot tall scale model of a high rise building, the team did quite well in ASCE's first appearance at the national level, placing first in the presentation category and ninth overall among the invited universities. Closer to home, in March a sizeable ASCE-UCLA contingent attended the Younger Member Forum of Los Angeles Student Night, an annual event for regional civil engineering students that includes dinner, a job fair, industry speakers, an awards ceremony, and plenty of networking opportunities. Four of our members received scholarships or awards,

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Chi Epsilon News

The Chi Epsilon chapter at UCLA enjoyed a productive and rewarding year. The first major event was the annual Pacific District conference, hosted by UC Berkeley in November. President Drew Kirkpatrick, vice president Thomas Curtis, treasurer Nergal Daniel, secretary Dan Leeper, editor Ross Miller and representatives from 12 other universities attended a variety of workshops, seminars, discussions, and presentations, concluding with a banquet in Berkeley's Hearst Mining Building, the recent beneficiary of a major seismic retrofit. Notably, the conference also included a fascinating tour of the renovated Bay Bridge. Led by two renovation project engineers, attendees took a tour bus across the bridge, stopping to examine piers at the bridge's north and south approaches and view the work being performed to complete the new bridge span. The tour was a great opportunity to get a first-hand look at the complicated design and large-scale construction challenges that practicing engineers must face.

The fall quarter continued with a 'signature party,' allowing candidate members to meet current members, officers, and faculty advisor Steve Margulis. Later in the quarter we instituted a new pre-initiation event – in what we hope will continue as an annual tradition – that also celebrates UCLA. We show candidates the practical, real-world applications of the civil engineering disciplines by examining various campus structures and landmarks. On this occasion candidates gained insight about geotechnical engineering related to the parking structure below Wilson Plaza, which required tie-backs and other geotechnical engineering solutions to protect the historic buildings surrounding it. Initiation day soon followed, where we proudly welcomed 18 new members into the fold. We thank Professors Steve Margulis, Jian Zhang, Keith Stolzenbach, Jonathan Stewart, Terri Hogue, and Ertugrul Taciroglu for lending their support and attending this rite. We especially want to thank Prof. Stanley Dong for his kind letter and donation to the event.

During the winter quarter, we sent two members to the XE Conclave, a biannual event that brings together all Chi Epsilon chapters nationwide to discuss the business of the organization and further the cause of civil engineering. Held at the Stevens Institute of Technology in Hoboken, New Jersey, the conclave included a bus tour highlighting the engineering marvels found within Manhattan, as well as an augmentation of and subsequent vote on Chi Epsilon bylaws. (All national Chi Epsilon decisions must be voted upon by student members at the conclave.) Among other things, the conclave approved an increase in the number of scholarships Chi Epsilon offers and elected a new national president. It also provided an excellent opportunity for students to explore New York City and socialize with other future engineers from across the country.

The chapter continued to offer EIT/FE examination preparation this spring, assisting over 40 people. XE alumnus and PE Patrick Ho (BS 2005, MS 2006) helped run multiple sessions, explaining the intricacies of the exam, conducting subject reviews and teaching test-taking strategies. We thank Pat for his continued service and commitment to the UCLA community and XE.

For more about Chi Epsilon, its activities and contact information please visit our website at www.seas.ucla.edu/chiep.

- Ross Miller, XE Editor

Drew Kirkpatrick assisted the C&EE editor in the development of this article.

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the most of any represented school. Finally, during April 14-18 ASCE participated in the annual E-Week festivities, organized by the Engineering Society of UCLA. We showcased our steel bridge, concrete canoe, and other conference projects. Other events included "E-Week Idol" and a "Concrete Bowling Extravaganza" for visiting middle school students.

To wrap-up the quarter ASCE enjoyed its annual end-of-year trip and banquet. The former took place on May 16-18 and included a day of boating on Lake Mead, a tour of the Cosmopolitan Hotel by a representative of the large-scale construction firm Perini, and a night in Las Vegas. The latter, on May 30, allowed us to acknowledge the hard work of this year's members and officers as well as introduce next year's board, elected earlier in the quarter. The banquet also gave us a chance to thank those who helped make this year such a success, among them faculty advisor Scott Brandenberg, C&EE Dept. Chair J.S. Chen, and C&EE alumni.

If you would like to contribute to our canoe team's upcoming trip to compete in Montreal, please email us at asce@seas.ucla.edu. To obtain more details about any of ASCE's activities, please read our own newsletter, found on our website at www.seas.ucla.edu/asce.

- Kilty Inafuku, ASCE Historian/Editor

Published every fall and spring, the C&EE newsletter is designed and edited by **Mike Gaetani**. *The editor thanks Kathleen Kelleher for technical assistance. This and previous newsletters can be viewed at* **http://cee.ucla.edu/cgi-bin/newsletters.php**.

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