

P.2 REAL-TIME HYBRID
SIMULATION



P.3 WORLD INNOVATOR
NAMED



P.11 NEW EARLY CAREER
CHAIR ANNOUNCED



Accomplished Alumni: USC Sonny Astani Department of Civil and Environmental Engineering alumni were honored at the second annual CEE awards night. From left are: Azzam Alwash, Nora McIntyre, John Morris, and John Shea (not pictured).

Distinguished Alumni Celebrated During Second Annual CEE Awards Night

During the second annual CEE Awards Event, held in April, four distinguished alumni of the department were recognized for their notable accomplishments.

John Shea (B.S. '44) received the Lifetime Achievement Award, the highest recognition at the event. He was honored for the breadth of his contribution and overall work experience in the engineering community. Shea is the chairman of the J.F. Shea group of companies, which was founded by his grandfather, John F. Shea, in Portland, Ore., in 1881. These companies consist of J.F. Shea Construction (heavy construction), Shea Homes (homebuilding), and Shea Properties (commercial development).

Azzam Alwash (Ph.D. '89) received the Senior Alumni Award for his tremendous leadership, achievements, and societal impact. In 2004, Alwash founded the nonprofit Nature Iraq and put his experience in hydraulic engineering to use, surveying the region and developing a master plan to restore Iraqi wetlands.

He reached out to the environment and water resource ministries to educate government officials about the environmental, social, and economic benefits of restoring the marshes.

Nora McIntyre (M.S. '13) received the Junior Alumni Award recognizing her achievements as a project engineer for JP Patterson, which twice awarded her its Recognition for Excellence and Commitment Award.

John Morris (B.S. '72) received the department's new Service Award, recognizing his leadership of the David M. Wilson Affiliates (DMWA) and his outstanding contribution and presence in the department and community.

The awards night, attended by more than 60 community members, faculty, staff, alumni, and Viterbi administration, was held at the Jonathan Club. The Alumni Awards are truly representative of the growing strength of the USC Sonny Astani Department of Civil and Environmental Engineering community and alumni network. ■

Advanced Seismic Testing Techniques Building on a Collaboration with Japan’s “E-Defense” Earthquake Engineering Laboratory

Devastating earthquakes around the world—such as those in Chile (M8.8, Feb. 27, 2010), New Zealand (M6.3, Feb. 22, 2011) and Japan (M9.0, Mar. 11, 2011)—are good reminders that we here in southern California must continue to pursue advanced research to ensure that buildings and civil infrastructure, both those existing and those yet to be built, are most cost-effective in providing safety and minimizing damage and economic loss.

In the Astani Department, Associate Professor Erik A. Johnson, in collaboration with colleagues at the University of Connecticut and Clarkson University, is researching advances in *real-time hybrid simulation (RTHS)*, an experimental structural testing technique in which part of the structure is physical and part is *virtual*, glued together with dynamic force actuators and sensors. *RTHS* allows researchers to physically test critical complex components of a structure—such as damping devices and seismic isolators, whose behavior depends strongly on the coupling with the rest of the structure—but without resorting to physically testing the entire structure (which would be very expensive and can only be done in one or two facilities worldwide). Since most of the structure is modeled in *RTHS* with computer algorithms, these models must be high fidelity and calibrated from full-scale tests whenever possible. Yet, conventional *RTHS* requires that these structural models be simple enough that a computer can simulate the structure’s response in real time to match the physical part of the experiment. Professor Johnson has been addressing this challenge

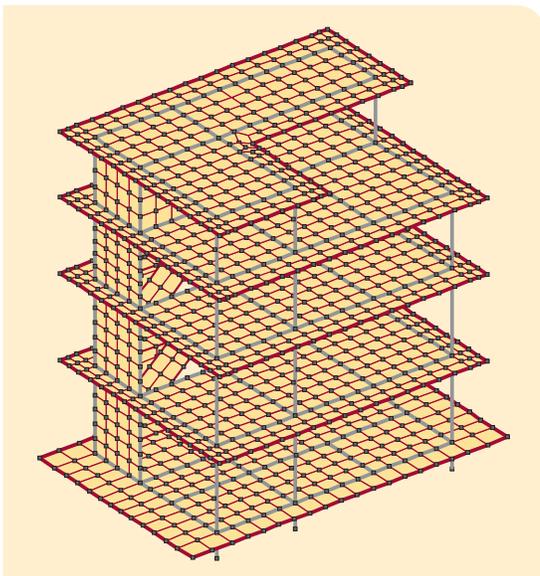


4-story RC isolated structure during August 2013 experiments at E-Defense

by developing computational algorithms that offload most of the computations to pre- and post-processing to minimize the number of calculations that must be done in real time during the physical experiment. The result is that extremely high fidelity models can be accommodated in *RTHS*, making the tests more realistic and more accurate, which will allow researchers to be more precise in their understanding of the effects of earthquakes on structures with advanced isolation and damping devices.

Professor Johnson is applying this technique specifically to study how to best use controllable dampers in base-isolated structures to minimize the internal motion of the structure while still accommodating very severe long-period earthquakes such as the March 2011 Tohoku earthquake in Japan. The numerical models in use by Professor Johnson are being calibrated from data taken during experiments, in which he was invited to participate, of a full-scale four-story reinforced-concrete base-isolated structure, tested near Kobe, Japan, in the “E-Defense” laboratory, which is the largest facility in the world for mounting full-scale structures on a seismic shake table to reproduce the effects of an earthquake. Professor Johnson and colleagues will then use these calibrated models as the numerical portion of *RTHS* studies with physical tests of various isolation components and controllable damping devices to demonstrate how these new concepts can be used to make structures safer during earthquakes.

These studies are partially funded by two grants from the National Science Foundation.



OpenSees finite element model of the 4-story superstructure of the E-Defense specimen created by Prof. Johnson’s graduate research assistant Mr. Wael Elhaddad

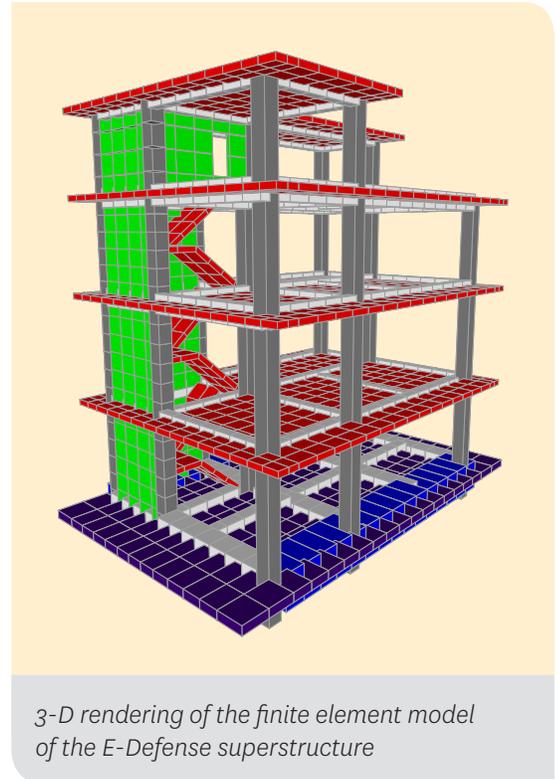


Erik Johnson, Associate Professor of Civil Engineering

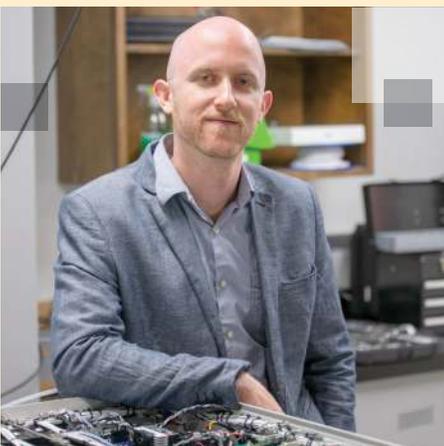
Dr. Johnson is the Associate Chair of the Astani Department and a Director of the American Automatic Control Council. He has been the chair of an ASCE technical committee and an associate editor for the ASCE Journal of Engineering Mechanics. He earned his B.S., M.S., and Ph.D. degrees in Aeronautical and Astronautical Engineering at the University of Illinois at Urbana-Champaign in 1988, 1993, and 1997, respectively. He was recognized with an Early Faculty Career Development (CAREER) Award by the National Science Foundation, an Outstanding

Recent Alumnus Award from the University of Illinois, and the Junior Research Prize and Medal from the International Association for Structural Safety and Reliability.

Dr. Johnson's research interests include "smart" structures, control of structural vibration, controllable damping devices, monitoring structural health, random vibration, and computational dynamics. ■



3-D rendering of the finite element model of the E-Defense superstructure



George Ban-Weiss, Assistant Professor of Civil and Environmental Engineering

MIT Technology Review Names Dr. George Ban-Weiss to World Innovator List

Dr. George Ban-Weiss has been named one of the world's top 35 innovators under the age of 35 by *MIT Technology Review*, recognizing his focus on the next generation of technological breakthroughs in environmental engineering that affect climate change. His research has contributed to multiple public policy changes at both the state and local level. Dr. Ban-Weiss will be profiled in the September/October issue of *MIT Technology Review*. He joins a hall of fame full of previous winners that include Facebook's Mark Zuckerberg, Apple's Jonathan Ive, iRobot's Helen Greiner, and Google's Larry Page and Sergey Brin, and our very own Burcin Becerik-Gerber, a 2012 TR35 honoree. ■

FACULTY NEWS



The 2014 CEE faculty retreat was held in January at the Huntington Library in Pasadena. The faculty discussed important topics such as ABET accreditation, curriculum revision, faculty webpages, and the CEE vision and strategic plan. After the retreat concluded, faculty and their guests attended a lovely dinner at the Athenaeum at Caltech.

FACULTY GRANTS

- **Dr. Constantinos Sioutas**
Project Title: E-Cigarette and Normal Cigarette Sidestream Analysis and Comparison Project
Agency: Instituto Nazionale dei Tumori: Fondazione IRCCS
- **Dr. Patrick Lynett and Dr. Costas Synolakis**
Project Title: Simulation of Tsunami-Induced Currents for Hazard Assessment and Mapping
Agency: California Geological Survey
- **Dr. Constantinos Sioutas**
Project Title: The Relation of Cardiovascular Health Outcomes to the Oxidative Potential of Particulate Air Pollution
Agency: AQMD (Collaborative research with the University of California, Irvine)
- **Dr. Roger Ghanem**
Project Title: Confident Predictions of Reservoir and Well Bore Flow Using Reduced Models and Data
Agency: URS Energy & Construction Inc.
- **Dr. Burcin Becerik-Gerber**
Project Title: CAREER: A Human-building Interaction Framework for Responsive and Adaptive Built Environments
Agency: National Science Foundation
- **Dr. Patrick Lynett**
Project Title: Faster than Real-time Coastal Wave Visualization with a Phase-Resolving Boussinesq-type Model
Agency: Office of Naval Research (ONR)

FACULTY AWARDS

- **Dr. Burcin Becerik-Gerber** received a NSF Career Award, one of the most respected awards given to young faculty. The award will fund research that she will complete in January 2019.
- **Dr. Geraldine Knatz** was named a member of the National Academy of Engineering, the highest professional distinction accorded an engineer.
- **Dr. Constantinos Sioutas** has received the American Association for Aerosol Research David Sinclair Award, recognizing his sustained excellence in aerosol research and technology.

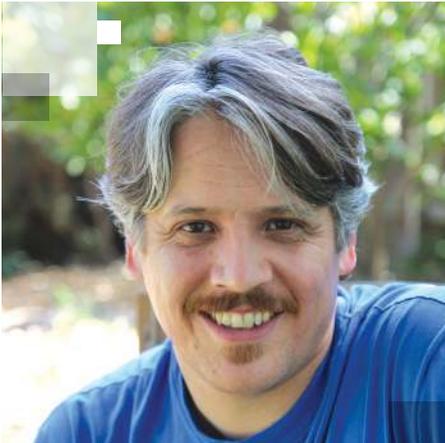
FACULTY HONORS

- **Dr. Felipe de Barros** has been named an associate editor for the *Journal of Hydrology*.
- **Dr. George Ban-Weiss** was recently awarded The Rose Hills Foundation Fellowship to study methods for countering local impacts of global climate change in Los Angeles.

FACULTY FELLOW

- **Dr. Kelly Sanders**, with husband Jason Sanders, will join USC's Parkside International Residential College (IRC) this fall as a Resident Faculty Fellow. ■

GRADUATE STUDENT NEWS



Daniel Lakeland (Ph.D. '13)

Ph.D. Student Spotlight: Daniel Lakeland

Soil liquefaction, the process by which saturated, unconsolidated soil or sand is converted into a suspension during an earthquake, is a major contributor to the damage done by earthquakes worldwide. While liquefaction has been studied actively by geotechnical engineers since the 1960s, realistic models to explain the phenomenon have been incomplete, until now.

Daniel Lakeland (Ph.D. '13) has developed a mathematical model for the motion of water through the soil skeleton. By carefully constructing the model and analyzing it in the appropriate context of shallow sandy soils, he discovered that water flow was critically important for the phenomenon, even on the timescales of a short-duration earthquake. His model showed that liquefaction occurs because of flow, densification, changes in permeability, or any mixture of the three. He also identified a thermal phenomenon which could become more important in low permeability soils such as silt.

This research was published by Dr. Lakeland and his advisors Dr. Amy Rechenmacher and Dr. Roger Ghanem in *Proceedings of the Royal Society A*. It attracted attention in popular

science news media, including an article on the ABC News science website in Australia, and an article in *ScienceNOW*, the online science news site from the American Association for the Advancement of Science.

Dr. Lakeland now develops mathematical models and analyzes data as a consultant. "Getting my Ph.D. from Viterbi gave me the opportunity to finely hone my analytical skills in physics, mathematical modeling techniques, and the statistical analysis of data," he says. "I aim to bring those skills to bear on real-world applications in the same variety of contexts that I have in the past, but with a new level of understanding." ■

PH.D. GRADUATING DINNER

Ph.D. candidates pose here during the 2014 Ph.D. Graduating Dinner, organized by Jennie Craig, in May at the University Club. They enjoyed other events during the spring semester, including the 2014 Ph.D. Seminar series and a March hiking trip at Eaton Canyon in Pasadena.



Ph.D. Hooding and Awards Ceremony

The 2014 USC Viterbi School of Engineering Ph.D. Hooding and Awards Ceremony took place in May at Bovard Auditorium. **Nan Li** received the Best Dissertation Award and was recognized for receiving the USC Ph.D. Achievement Award. **Farrokh Jazizadeh Karimi** was acknowledged for receiving the Astani CEE Department award for Best Research Assistant and **Mahmoud Kamalzare** was recognized for receiving the Astani CEE Department Award for Best Teaching Assistant. Congratulations to our CEE graduates:

Heather Brandow / Dissertation Chair: *Vincent W. Lee* / Dissertation: *Two-dimensional Weighted Residual Method for Scattering and Diffraction of Elastic Waves by Arbitrary Shaped Surface Topography*

Armen Derkevorkian / Dissertation Chair: *Sami F. Masri* / Dissertation: *Studies into Data-driven Approaches for Nonlinear System Identification, Condition Assessment, and Health Monitoring*

Lesley Ewing / Dissertation Chair: *Costas Synolakis* / Dissertation: *Community Resilience to Coastal Disasters*

Farrokh Jazizadeh Karimi / Dissertation Chair: *Burcin Becerik-Gerber, Lucio Soibelman* / Dissertation: *User-centric Smart Sensing for Non-intrusive Electricity Consumption Disaggregation in Buildings*

Mahmoud Kamalzare / Dissertation Chair: *Erik A. Johnson* / Dissertation: *Computationally Efficient Design of Optimal Strategies for Semiactive Damping Devices in Smart Structures*

Vahid Keshavarzadeh / Dissertation Chair: *Roger Ghanem* / Dissertation: *Design Optimization Under Uncertainty for Rotor Blades of Horizontal Axis Wind Turbines*

Daniel Lakeland / Dissertation Chair: *Roger Ghanem* / Dissertation: *Continuum Modeling Techniques and their Application to the Physics of Soil Liquefaction and Dissipation Vibrations*

Nan Li / Dissertation Chair: *Burcin Becerik-Gerber, Lucio Soibelman* / Dissertation: *A Radio Frequency Based Indoor Localization Framework for Supporting Building Emergency Response Operations*

Weixuan Li / Dissertation Chair: *Dongxiao Zhang* / Dissertation: *Inverse Modeling and Uncertainty Quantification of Nonlinear Flow in Porous Media Models*

Shentong Lu / Dissertation Chair: *Jiin-Jen Lee* / Dissertation: *Numerical Analysis of Harbor Oscillation under Effect of Fluctuating Tidal Level and Varying Harbor Layout*

Ahmed Mantawy / Dissertation Chair: *James C. Anderson* / Dissertation: *Behavior of Ductile Reinforced Concrete Frames Subjected to Multiple Earthquakes*

Mohammad Rahmani / Dissertation Chair: *Maria Todorovska* / Dissertation: *Wave Method For Structural Health Monitoring and Post-earthquake Damage Detection in Buildings* ■



Elham Hemmat Abiri was awarded the Phi Beta Kappa International Scholarship as a foreign graduate student of academic excellence, one of only two students awarded the scholarship at USC this year. She has received the Astani CEE Department Best Teaching Assistant Award for three academic years and was also nominated for the USC Outstanding Teaching Assistant Award for two academic years.



2014 Ph.D. Graduates From left: Farrokh Jazizadeh Karimi, Nan Li, Lesley Ewing, Dr. Maria Todorovska, Mohammad Rahmani, Dr. Costas Synolakis, Ahmed Mantawy, Vahid Keshavarzadeh, Mahmoud Kamalzare, Dr. Lucio Soibelman, and Dr. Erik Johnson

★ Alumnus Named 2014 Membrane Young Professional of the Year

Michael Hwang (CEE '05), an associate engineer at CH2M HILL, was recently selected as the 2014 Membrane Young Professional of the Year by the American Water Works Association (AWWA) and the American Membrane Technology Association (AMTA). The award recognizes and honors young professionals for their outstanding contribution in water reliability, water quality, new directions in water treatment technologies, or membrane applications.

“Michael is a distinguished young professional in the field who has demonstrated great passion as a water treatment engineer,” said Jim Lozier, global technologist for desalination at CH2M HILL. “In his relatively short career, he has contributed significantly to the success of a variety of membrane-based projects for both municipal and industrial clients that incorporate desalination, indirect potable reuse, and concentrate management. It is an honor to have him represent CH2M HILL as the 2014 Young Professional of the Year.”

Hwang works with others at CH2M HILL to address challenges associated with sustainable and cost-effective management of brine generated from the treatment of water produced from coal seam gas extraction in Queensland, Australia. He is part of the team that developed an innovative process called Max-RO (maximum recovery reverse osmosis) that combines chemical precipitation, ceramic ultra filtration (CUF), and ultra-high pressure RO to treat the water during gas extraction. The treated water is then used for a variety of non-potable demands. The process minimizes the volumes of waste brine that must be stored in evaporation ponds or deep well injected. ■



Michael Hwang (CEE '05)



Alumni Tie the Knot

Katharina Zappei and Adam Forouzandeh, both class of 2008 alumni, married in August in Santa Barbara. The couple's careers keep them busy: Katharina is presently working on the UCLA Luskin Conference and Guest Center, and Adam is working on a 216-unit single family home development in Camarillo, and the Lighthouse Point development in Santa Barbara.

UNDERGRADUATE STUDENT NEWS



The Student Recognition Ceremony in May at the Bovard Auditorium recognized and honored students for outstanding leadership, volunteerism, and commitment to the campus and community. Congratulations to the winners of this year's student recognition awards!

2014 Student Recognition Awards

THE ORDER OF TROY

- Davi Corcio-Alvarez** / Civil Engineering
- Brittany Moffett** / Civil Engineering
- Laura Pochowski** / Civil Engineering and Financial Engineering
- Naren Sahai** / Environmental Engineering
- Mia Smith** / Environmental Engineering
- Elise Takebayashi** / Environmental Engineering

THE ORDER OF ARETE

- Christina Becerra-Jones** / Civil Engineering

GLOBAL SCHOLARS

- Laura Pochowski** / Engineering Better Structures for Impoverished Communities

THE LAUREL AND THE PALM

(highest honor bestowed on graduating seniors)

Aja Canyon

Graduating with a degree in civil engineering with an environmental emphasis, Canyon is the founder of Goti, an organization that facilitates and funds international service trips for underprivileged youth. She served as the brand manager for USChange Movement and has done extensive engineering research on water in the environment. She has also participated in Alternative Winter Break India and is a member of the National Society of Black Engineers.

Kirsten Rice

Graduating with a degree in civil engineering with an environmental emphasis and a minor in photography in addition to a master's degree in mechanical engineering, Rice is co-founder of the Community Water Project. She has served on the executive board of QuASA, as the chair of CALPIRG, a member of the Rights of Sisterhood, president and vice president of Tau Beta Pi Engineering Honor Society, and captain of the USC Marathon Team. She has participated in Engineers Without Borders to design rural water treatment services for villages in Honduras, volunteered as a youth mentor in Cape Town, South Africa, at Youth in Prison, and will be traveling to Uganda through the Volunteer Center Alternative Summer Break program. ■

2014 USC Viterbi Undergraduate Awards

USC VITERBI-WIDE AWARDS

Outstanding Achievement in Leadership

Elise Takebayashi / Environmental Engineering

Grand Challenges Scholars

Mia Smith / Environmental Engineering

Zachary Gima / Environmental Engineering

Kirsten Rice / Environmental Engineering

Ian Malave / Computer Science

USC VITERBI DEPARTMENTAL AWARDS – THE SONNY ASTANI DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

David M. Wilson Affiliates Award for Outstanding Achievement

Tae Yoon / Civil Engineering

David M. Wilson Affiliates Award for Outstanding Achievement

Kirsten Rice / Environmental Engineering



Each year, more than 1,000 civil/environmental engineering students from 18 different universities compete in the American Society of Civil Engineers (ASCE) Pacific Southwest Conference (PSWC). In April, USC ASCE sent 41 students to San Diego State University to race our concrete canoe, construct our steel bridge, test our geotechnical retaining wall, remove nitrate and phosphorus with a water filter, survey elevations and distances, and show off our athleticism and ability to think on our feet. Our members worked all year long on these projects, and our hard work paid off! This was the first PSWC experience for most of our 41 competing members, so it was a great surprise accomplishment to place third overall out of 18 universities. For more information about USC ASCE or our journey to compete at PSWC, visit our website at www.uscasce.com.

– By Elise Takebayashi, USC ASCE President ■

NEWSLETTER



2014 HARD HAT CELEBRATION

About 40 seniors attended April's hard hat celebration, organized by Dr. Emily Caviglia, director of CEE undergraduate programs. The students ate pizza and drank champagne while they signed their peers' USC Sonny Astani hard hats. Congratulations seniors!



COMMENCEMENT

The 2014 Astani CEE Commencement Reception in May was organized by Dr. Emily Caviglia, director of CEE undergraduate programs, and took place at South Gerontology Lawn. Graduates, family, friends, faculty, and staff attended the event. Congratulations to all the graduates!

Fun for All

CEE students and faculty enjoyed both the 2014 talent show and a ski trip this year. The third annual talent show showcased a range of student, faculty, and staff talents. Organized by Erica Arnold under the advisement of Dr. Emily Caviglia, the event was held at the Parkside Performance Café and was attended by about 50 people. Faculty member Dr. George Ban-Weiss demonstrated his talent playing the bass, and Jennie Craig, CEE graduate advisor, displayed her artwork. Several undergraduates, masters, and Ph.D. students also performed using a range of talents in music and fine arts.

In March, 76 students and faculty including Dr. Lucio Soibelman, Dr. Becerik-Gerber, Dr. David Gerber, Dr. Ketan Savla, and Dr. Kelly Sanders, enjoyed a ski trip to Big Bear. Thanks to Jennie Craig for organizing the event. ■

David M. Wilson Affiliates and the New Early Career Chair Named for David M. Wilson

■ *Gregg E. Brandow, Ph.D., PE, SE, Professor of Engineering Practice*

I have been supporting our Sonny Astani Department of Civil and Environmental Engineering through the David M. Wilson Affiliates (DMWA) since I finished graduate school back in 1971. My father George Brandow and his partner Roy Johnston were Professor David Wilson's "boys." He mentored and gave them the tools for successful careers in structural engineering. I never knew David Wilson, but I heard the stories of his great teaching style, his intense interest in the students, and the generosity of his time and personal finances to help his students.

The DMWA was created in Professor Wilson's memory to honor this selfless scientist who gave his own time and money to help support research and programs for his students. Since 1959, CEE alumni have come together under the auspices of DMWA to raise funds for scholarships, provide networking and mentorship, and deliver resources for CEE students to help them achieve their goals of becoming CEE engineers. This year the DMWA provided for:

- Student travel to the Chi Epsilon National Conclave
- Student travel to the ASCE Pacific Southwest Conference in San Diego
- Accelerometers for the shake tables in the teaching laboratory
- Commencement luncheon for CEE students and families
- Transportation for a ski trip to Big Bear for undergraduate and graduate students
- Polo shirts with the DMWA embroidered logo
- Scholarships from the David M. Wilson Endowments
- Book awards for academic achievement

Now, the DMWA Board of Directors is supporting the creation of the David M. Wilson Early Career Chair in Civil Engineering and encourages alumni and friends to contribute to this effort, launching a \$20,000 Matching Gift Challenge to motivate former members to renew their memberships and to encourage new members to join the DMWA.

A gift of \$200 a year will support CEE students and make you a member of the DMWA, where you will have the opportunity to lend your voice and work alongside other CEE alumni to help our future Trojan engineers.

I personally encourage all of you to contribute to this Chair for David Wilson. To make your gift in support of the David M. Wilson Affiliates, no matter the size, please go to: www.viterbi.usc.edu/givetoviterbi. Questions? Please call 213.821.2921. ■

DMWA BOARD MEMBERS

From left: Larry Lewis, John Morris (DMWA President), Stephen Dopudja, Dr. Lucio Soibelman, and Professor Hank Koffman





Dr. Lucio Soibelman

Chair's Message

Greetings! The department is always busy, and this summer was no exception with building renovations and expansion being the most visible project. We've added an additional faculty office in KAP and shortly will embark on second-floor renovations to BHE to add more space for the Tsunami Research Group, additional offices, a conference room, kitchen, and lounge. The Soil Mechanics Lab is larger, there's an elevator now in BHE, and a new Water Lab in Biegler Hall, which will host the desalination research under Dr. Amy Childress, and research on environmental microbiology under Dr. Adam Smith. Plus, the Environmental Sustainability Lab will now host research by Dr. George Ban-Weiss, Dr. Felipe de Barros, and Dr. Kelly Sanders.

Community building is just as important to us as department building. You can experience that camaraderie in the CEE lounge in KAP 203, where faculty, staff and students often mix in harmony. Plus, we are always interested in coordinating student/faculty events like hiking and skiing trips and barbeque tailgates at football games. You, too, are an important part of our community. Please come visit our department, and keep us informed about your life and career achievements. ■



Sonny Astani and Dean Yannis Yortsos visit CEE's renovated offices and lounge.