

Adam Smith: Sustainability Scholar



Population growth and climate change threaten the United States' water supply and stress its aging water management infrastructure, most of which was built in response to the Clean Water Act of 1972.

According to Adam Smith, assistant professor of civil and environmental engineering, now is the time to implement new technologies that improve sustainability and resilience. Much of his research re-envision wastewater treatment plants as resource recovery facilities that produce net energy, recover nutrients for agriculture, and maximize potable and non-potable water reuse.

Smith, along with collaborators at Rice University, are investigating ways to reduce the risk of antibiotic-resistant microorganisms through water management via a grant from the National Institute of Food and Agriculture. A key concern is horizontal gene transfer, in which even distantly related microorganisms can share resistance genes. The Smith Research Group is evaluating antibiotic resistance profiles in bench-scale wastewater treatment systems in USC's Water and Environmental Technology Lab to identify ways to reduce the environmental spread of resistant microorganisms. The group is also collaborating with the Orange County Water District to investigate antibiotic resistance genes and microbial water quality in its indirect potable reuse system, the largest in the world.

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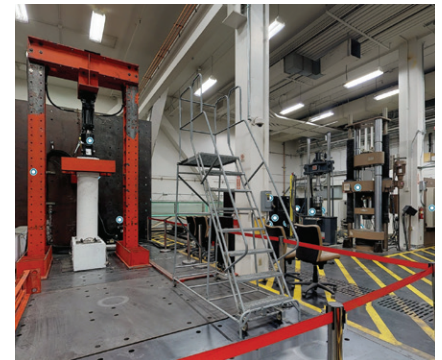
Big Impacts

Helping a Hurricane-Ravaged Island Recover

Civil engineering alumnus PJ Wilson aims to popularize solar power in Puerto Rico.

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Spotlight On...





A Construction and Infrastructure Research Resource

The Sonny Astani Department of Civil and Environmental Engineering's Structures and Materials Research Laboratory (SMRL) is a newly established, state-of-the-art facility specifically designed for construction materials and infrastructure systems research.

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Remarkable Research

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Smith also serves as co-PI on a National Science Foundation project with Amy Childress, director of the environmental engineering program, investigating the effect of material properties on performance of membranes used in membrane distillation. Additionally, his PhD students Stephanie Gee and Tranicè Warner, both NSF Graduate Research Fellows, are developing novel materials like piezoelectric nanofiber and nanocomposite membranes to improve separation process efficiency.

Additional Areas of Focus

With industry partner Divert, Inc., Smith received NSF Grant Opportunities for Academic Liaison with Industry funding to evaluate anaerobic membrane bioreactors (AnMBRs) for energy recovery from food waste following California's new legislation requiring landfill food waste diversion for commercial entities.

His group used life cycle assessment as a preliminary screening tool to test their hypothesis that food waste management in AnMBRs improves environmental impacts over competing alternatives. Their results motivated collaborative research with Divert, which operates a full-scale treatment system at Ralph's Distribution Center. Yamrot Amha, a PhD student in the Smith Research Group, is now using bench-scale systems that represent Divert's full-scale systems to identify parameters that maximize the conversion of food waste to biogas, an energy-rich mixture of methane and carbon dioxide.

Smith also helped design a new instructional lab shared between the Sonny Astani Department of Civil and Environmental Engineering and the USC Department of Biomedical Engineering. It was first used last fall as part of Smith's "Introduction to Environmental Engineering Microbiology" course.



Big Impacts

PJ Wilson (right) distributes solar power kits in hurricane-ravaged Puerto Rico.

Helping Power Puerto Rico's Recovery

After more than a decade at Renew Missouri, PJ Wilson (BS CE '01) started to feel burned out.

As much as he enjoyed his job, Wilson, 40, worried that if he failed to make a change, he would end up with "gray hair, the next few decades having flown by and retirement from clean energy advocacy without having left the great state of Missouri." So, the former Peace Corps volunteer phased himself out of a job by helping to find his replacement executive director and "retired" to consider the next chapter of his life.

In September 2017, Category 4 Hurricane Maria roared through Puerto Rico, claiming an estimated 4,600 lives, causing \$90 billion in damage and knocking out power to the entire island. Wilson opined on Facebook, "This seems like a great opportunity for Puerto Rico to rebuild sustainably."

Introducing Alternative Energy

With an extensive background in solar energy, a love of Latin America born from three years in the Peace Corps and a USC Viterbi degree in civil engineering, Wilson was inspired to help the island.

He founded Solar for Puerto Rico, built a website for the newly minted nonprofit and raised \$5,000 through GoFundMe. In November 2017, Wilson filled two suitcases with dozens of small solar and battery kits he bought on Amazon and headed to Puerto Rico.

"I am passionate about helping the people of Puerto Rico. This is the part of America that needs the most help right now," Wilson says.

Wilson and volunteers have distributed 750 solar kits, mainly to remote and rural parts of the island that are still without a reliable source of energy. Each contains a small solar panel, a battery to store energy, two lightbulbs and USB ports. The power generated can charge cellphones and power lights, fans or even small refrigerators. They teach residents how to use the kits, noting that they need to keep the small solar panels on roofs even during cloudy, rainy days.

To date, Wilson has raised nearly \$300,000. He eventually hopes to distribute 50,000 solar kits to 10 Puerto Rican towns. He sells them below retail and uses proceeds to buy more kits. Edwards Mother Earth Foundation, a Seattle-based family foundation dedicated to enhancing sustainability, recently awarded Wilson's nonprofit an \$89,000 grant.

But Wilson wants to do more than distribute solar kits. He aims to popularize solar power in Puerto Rico, which had an aging and inefficient power grid prone to blackouts long before Maria struck and 98 percent of its energy coming from expensive oil and gas imports. He recently co-founded the Puerto Rico chapter of the nonprofit Solar and Energy Storage Association and plans to spend at least five years helping the island switch to a cleaner, cheaper and more dependable energy source.



Big Impacts

Engineering Solutions for Refugees’ Biggest Challenges

Last September, biomedical engineering senior Sahit Menon found himself in a classroom at the gates of Moria, the infamous refugee camp on the Greek island of Lesbos that is home to an estimated 9,000 asylum seekers. Menon had arrived just days before as part of a taskforce of USC students sent to research and find immediate engineering solutions to the global refugee crisis.

“I was in sheer disbelief that humans could endure such circumstances,” says Menon.

His disbelief was shared by 13 other USC students on this mission to Lesbos. Since 2015, the island has been the main gateway to Europe for millions of asylum seekers fleeing wars in places like Syria, Iraq and Afghanistan.

The students represented seven USC colleges, all part of the interdisciplinary “Innovation in Engineering Design for Global Challenges” course. It is taught by Associate Professor and Stephen Schrank Early Career Chair in Civil and Environmental Engineering Burcin Becerik-Gerber, Associate Professor of Practice in Civil and Environmental Engineering and Architecture David Gerber and lecturer Brad Cracchiola, a product development engineer and USC Viterbi alum (BS AE ’93; MS ME ’98).

Over two semesters, students work on a project, product or service that addresses the needs of refugees and local communities caught up in a crisis. Ideas include improved sanitation, shelters, innovations to address the mental health and well-being of children in camps, local empowerment, education, access to information and security.

In addition to conducting research, students spent time volunteering inside the camps, namely inside the Safe Zone – an area of Moria that houses unaccompanied minors – and meeting with key stakeholders. According to camp management, this was the first time a university group was granted access to Moria.

Immersion Leads to Insights

Led by Becerik-Gerber and Daniel Druhora, co-founder and program coordinator of The Virtual Refugee Exchange, the students’ mission was to build relationships with local stakeholders, survey the camps and conduct user-research and problem discovery that would form the basis for their engineering and innovation projects.

“You can’t innovate in a bubble,” says Becerik-Gerber. “It is of paramount importance to expose students firsthand to the realities of the crisis and to help them make the connections to local stakeholders, international aid organizations operating in these hot spots, regional and local governments, private enterprise and refugees themselves.”

To the students, Stavros Mirogiannis, camp manager at Kara Tepe, a smaller refugee camp on Lesbos that houses families with children and other vulnerable refugees, said, “We need your ideas, your ways of thinking about the problems we face.”

“It is of paramount importance to expose students firsthand to the realities of the crisis.” – Burcin Becerik-Gerber



Mechanical engineering student Siena Applebaum and global health student Mia Poynor volunteer at Kara Tepe Refugee Camp on the Isle of Lesbos, Greece. (Photo by Daniel Druhora)

SPOTLIGHT ON...



A Construction and Infrastructure Research Resource

The Sonny Astani Department of Civil and Environmental Engineering's Structures and Materials Research Laboratory (SMRL) is a newly established state-of-the-art facility specifically designed for construction materials and infrastructure systems research. As a recharge center, SMRL is open to any user within or outside of USC on a pay-by-use basis. In addition to Bora Gencturk, director of SMRL, associate professor of civil engineering and a registered professional civil engineer in California, SMRL employs two full-time staff, a laboratory coordinator and a laboratory technician. The laboratory is currently in the process of obtaining an ISO 17025 accreditation from the International Accreditation Service, which will put SMRL in a unique position to serve Southern California industries as a leading testing laboratory.

SMRL features a series of servo-hydraulic actuators for structural testing and five universal testing machines for mechanical characterization of materials. Researchers have access to a dedicated room for mixing and casting cementitious materials, which includes concrete mixers, two sieve shakers, a vibrating table, a concrete cylinder end grinder, a masonry saw and a flow table. Other equipment for measuring the fresh properties of cementitious materials and molds of standard sizes for ASTM tests are also on-site. Additionally, SMRL has a salt-spraying chamber, a moist-cure chamber, two high-range ovens and a furnace for materials curing, conditioning and long-term durability testing.

SMRL is
1 OF 50
USC recharge centers.

SMRL features
500+ square meters
of test space &
associated fabrication facilities.

One universal testing machine's environmental chamber has a temperature range of -130 to 315 °C for thermomechanical testing of materials under loads of up to 500 kN.

For structural testing, servo-hydraulic actuators with capacities ranging from 50 to 1,500 kN are available, and five universal testing machines with capacities from 5 to 4,500 kN are on-site for mechanical characterization of materials.

Concrete mixers with yield capacities ranging from **7.5 to 150 liters** are housed in a dedicated room for mixing and casting cementitious materials.

➤ For more information, visit smrl.usc.edu.

Le Val Lund Lecture Honors an Industry Leader

In honor of Le Val Lund, Jr., a recognized expert on protecting urban lifelines from natural and manmade disasters, USC and Caltech hold an annual lecture on lifeline infrastructure and community resilience and recognize an important contributor to this field. The 2018 award recipient and lecturer, Yumei Wang, an Oregon Department of Geology and Mineral Industries resilience engineer, spoke of the importance of resilient infrastructure and the need for coordination between system designers and operators.



Yumei Wang receives the 2018 Le Val Lund Practice Award for Lifeline Risk Reduction. (Photo by Kirsten Briggs)

REMARKABLE RESEARCH

Prolonging the Life of Concrete



Xiaoying Pan, a first-year civil engineering doctoral student advised by Bora Gencturk, director of SMRL and associate professor of civil engineering, is developing a new type of self-healing concrete. She seeks to eliminate crack issues in concrete and prolong the service life of concrete structures. Her research is focused on optimizing concrete's self-healing system while decreasing its cost by applying additive manufacturing. Pan believes self-healing concrete can help the concrete industry overcome current limitations.

Born and raised in Nanning, China, Pan received her bachelor's and master's degrees in civil engineering from Hunan University, China, before coming to USC. Her master's thesis focused on surface treatment of concrete, and she developed several new inorganic surface treatment methods to increase the resistance of concrete to aggressive environmental factors.

Ensuring Energy-Efficient Clean Water

Tranicè Warner, a 22-year-old environmental engineering doctoral student in the Sonny Astani Department of Civil and Environmental Engineering, is working to reduce the energy demands of treating wastewater.

As the population continues to increase, so will demand for wastewater treatment. Currently, this is an energy-intensive process. By developing new materials for membrane filtration that mitigate overall energy consumption, the carbon footprint and capital and operating costs of treatment can be greatly reduced.

The clarity of Warner's academic vision has garnered her national recognition. She received an NSF Graduate Research Fellowship, which fully funds her doctoral studies and provides additional funding for traveling to academic conferences.

Advised by Adam Smith, assistant professor of civil and environmental engineering, and Amy Childress, director of the environmental engineering program, she is now fabricating novel membrane materials that could reduce wastewater treatment systems' energy demands and improve treated water quality. Warner hopes her membranes will reduce the incidence and severity of membrane fouling, in which particles deposited on a membrane surface clog the membrane pores and increase the pressure and energy required to filter water through the membrane area.

Warner has a longstanding commitment to water resources. At Fresno State, where she received her undergraduate degree, she worked primarily on wastewater-related research projects.



Honoring Exceptional Research and Teaching Assistants

On October 10, faculty, students and staff from the Astani Department of CEE recognized the work of several exceptional graduate students at their annual Research Assistant and Teaching Assistant Awards. Here are the award winners:

Best Research Assistants

- ▶ Allyson McGaughey
- ▶ Rebecca Peer
- ▶ Kun-Hao Yu

Best Teaching Assistants

- ▶ Lauren Crawford
- ▶ Mohammad Sowlat
- ▶ Runhe Zhu

HIGHLY ACCOMPLISHED

Sanders Receives NSF CAREER Award



Kelly Sanders, Dr. Teh Fu Yen Early Career Chair and assistant professor of civil and environmental engineering and spatial sciences, recently received a 2019 NSF Early CAREER Award. She is recognized for her project proposal to evaluate how future climate change might impact the performance and environmental externalities of electricity-generating units due to increased heat and changes to cooling water reserves. The project will also explore how changes in methods of energy consumption might offset negative impacts of climate change on the power sector and enable higher penetration rates of variable renewable energy sources.

Ban-Weiss Honored With AGS Award



The American Geophysical Union (AGS) selected **George Ban-Weiss**, Pasquale and Adelina Arpea Early Career Chair and Assistant Professor of Civil and Environmental Engineering, as its 2018 recipient of the Global Environmental Change Early Career Award. Ban-Weiss' research investigates how climate, air quality and land cover interact, from urban to global scales, and looks at practical solutions for mitigating climate change and air pollution in urban areas.

Celebrating Alumni Accomplishments

The Sonny Astani Department of Civil and Environmental Engineering recognized some of its exceptional alumni during an annual awards dinner on January 31.

Outstanding Junior Alumni Award

Currently a project manager at KPFF Consulting Engineers, **Kristen Sharer** has been involved in a wide variety of projects and industries. She spent the fall volunteering with Engineering Ministries International, where she upgraded crucial infrastructure at a hospital in Kenya, and she is a mentor with the Viterbi Student-Alumni Mentoring Program.

Distinguished Alumni Award

After 20-plus years with the California Department of Transportation, **Raymond Walter Wolfe** is now executive director of the San Bernardino County Transportation Authority. He manages a \$1 billion budget, oversees infrastructure construction projects and commuter services, manages air quality programs and implements alternative fuel and energy programs.

Alumni Service Award

Recipient **Amanda Heinke** is a senior transportation planner and project manager at Fehr & Peers in Los Angeles, where she works on traffic impact analyses. She has served on the Los Angeles chapter of the Women's Transportation Seminar since 2012, occupying various leadership positions on the board, including president.



The recipients of the 2019 alumni awards. From left to right: Raymond Walter Wolfe, Department Chair Lucio Soibelman, Amanda Heinke, and Kristen Sharer. (Photo by Kayly Luong)

HIGHLY ACCOMPLISHED

USC's Construction Management Association of America Student Chapter

In February 2018, at the 32nd Annual ASC Student Competition, in Sparks, Nevada, USC CMAA students won second place in the Mixed-Use Competition and first place in the Alternates Competition. A member of the Preconstruction Team received a Most Valuable Player award by PCL Construction.

In fall 2018, a USC CMAA student team won third place in the Preconstruction Competition at the 2018 ASC Region 3 Open Competition, in Downers Grove, Illinois, and the chapter hosted its 24th annual symposium, "Constructing the Unconventional," which highlighted unique projects with unconventional designs.

➤ Visit uscmaa.com to learn more.

USC's American Society of Civil Engineers Student Chapter

ASCE hosted more than 20 events, from information sessions to concrete canoe pouring to beach bonfires, over the last year. In April, the chapter participated in the Pacific Southwest Conference at California Polytechnic State University, San Luis Obispo.

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If you're interested in sponsorship, get in touch at uscasce.com.

USC Construction Alumni Group

With the help of the Hathaway Dinwiddie/AECOM HUNT Construction project team, the USC Construction Alumni Group hosted a jobsite tour and networking hour at the Los Angeles Memorial Coliseum project in December. In February, it hosted its third Distinguished Leader Speaker Series event, during which Doug Mouton shared how his experiences during Hurricane Katrina and while serving in Afghanistan shaped his leadership style at Microsoft as general manager of Global Data Center Execution.

➤ Visit uscaec.org to learn more about the group and join the mailing list.



David M. Wilson Early Career Chair

The establishment of the David M. Wilson Early Career Chair will complete the David M. Wilson Affiliates founding mission: to create a lasting memorial in Civil Engineering to one of USC Viterbi's most influential and generous faculty members, David M. Wilson.

A faculty position in Professor Wilson's name will celebrate his commitment to teaching students and preparing professionals in Civil Engineering. Generous alumni and friends have made gifts and pledges to the David M. Wilson Early Career Chair Fund totaling \$937,000 toward the \$1 million required. Beginning with a gift from the Estate of Lawrence & Ruth McConville, support has come from Professor Wilson's students from over 60 years ago and more recent CE alumni that have benefited from scholarships and support for student activities that has come from the DMWA program.

Please join CEE alumni and friends in honoring the legacy of David M. Wilson. If we can provide more information on how you can support the CEE Department, contact brandow@usc.edu. For more information about making a gift to the Early Career Chair or including USC in your estate plans, please contact Elizabeth Nesbitt at (213) 740-4032 or enesbitt@usc.edu.

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We're eager to
hear about the
great things our
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salinapa@usc.edu.

CHAIR'S MESSAGE

Welcome to the Spring Edition of our newsletter. Though we come to a close of another academic year, the department continues its success and achievements.

I am pleased to report that the Sonny Astani Department of Civil and Environmental Engineering is on a solid foundation and continues to maintain a strong academic community of exceptional faculty, hardworking staff and a remarkable student body. This could not be accomplished without the extraordinary support from all of you.

The last few months have been incredibly busy for our department. We have launched new teaching initiatives and seen the broader impact of our research in the world, as you will see in this issue.

As you may know, the department's faculty serves as our foundation, and their hard work and dedication are unwavering. Each issue of our newsletter showcases faculty highlights, featuring many of their accomplishments, and this issue is no exception. Of special note, Dr. Kelly Sanders, assistant professor, was recently awarded a 2019 National Science Foundation Early CAREER Award for her proposal, entitled "CAREER: Coordinating climate change mitigation and adaptation strategies across the energy-water nexus: An integrated research and education framework." Our faculty members continue to conduct cutting-edge research on many fronts and receive national recognition. It is no doubt that we have superior world-class faculty members in our department.

Furthermore, our students continue to excel in academics and research, and they demonstrate remarkable initiative and compassion with their domestic and international outreach efforts. I am proud to support them in each new endeavor they embark on.

In closing, more and more of our alumni are getting informed and involved and supporting the Astani Department of CEE. I invite you to join us and encourage you to send us news of your accomplishments so that we can share them in our next newsletter.

Lucio Soibelman, PhD

*Chair of the Sonny Astani Department of Civil
and Environmental Engineering*

