Researchers active from Philadelphia to the Cascades and Indonesia

Turning the Wissahickon Creek green to test its health

Postdoctoral student Sarah H. Ledford and Professor Laura Toran, along with Marie Kurz, assistant research professor at the Academy of Natural Sciences of Drexel University, recently conducted two stream tracer tests to investigate the health of the Wissahickon Creek ecosystem. They turned 1 to 2 kilometers of the stream bright green using two non-toxic, fluorescent dyes, fluorescein and resazurin. Aided by a small army of volunteers, they tracked how these tracers revealed water flows in the stream and where and how much stream metabolism occurs. The tests were conducted in consultation with the Pennsylvania Department of Environmental Protection. Additional funding for the project was obtained from the National Science Foundation based on the extensive William Penn Foundation-funded data logger network in the Wissahickon that is studying controls on nutrient concentrations in the stream.

Combining solar energy and agriculture in Indonesia

New research projects by Assistant Professor Sujith Ravi are exploring combined land use of solar infrastructure and agriculture for socioeconomic and environmental co-benefits in the tropics. Ravi and graduate student Chong Seok Choi are investigating opportunities in Indonesia to incorporate micro-scale renewable solar energy into existing cropping systems.

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STUDENT SPOTLIGHT

GEOLGY

Melissa Enyo Sherman, BS ’18, was a Frances Velay fellowship awardee. Over the past year she studied the impact of anthropogenic plants in Pennsylvania watersheds with Assistant Professor Bojeong Kim. This summer she is studying field geology with the Indiana University’s Field Camp in Montana’s Tobacco Root Mountains. In August, she presented a poster summarizing her aquatic plants research at the Goldschmidt Conference on geochemistry in Boston.

ENVIRONMENTAL SCIENCE

Alex Cagle, BS ’18, majored in environmental science with a minor in corporate social responsibility (Fox School of Business). He conducted undergraduate research with Dr. Sujith Ravi investigating the potential impacts of large-scale solar energy development on soil and hydrological processes through a combination of field experiments at the National Renewable Energy Laboratory’s solar test site in Colorado and data analysis. This novel project addresses the critical balance between the benefits and environmental impacts of solar photovoltaics at a time of massive industry expansion; thus, the findings of his project interest both scientists and land developers.

As the lead author, Cagle presented his findings at the fall meeting of the American Geophysical Union in December in New Orleans, for which he was awarded travel funding from the TU Creative Arts, Research and Scholarship (CARAS) program. He was also a varsity soccer player; member of the Athletic Director’s Honor Roll; Temple Honors program member; Temple Scholar-Athlete of the Year 2016; and the 2016 soccer Scholar-Athlete of the American Athletic Conference. He will begin pursuing a PhD in energy systems at the University of California, Davis this fall.

MASTER OF SCIENCE

Victoria Rivera-Banuchi, MS ’18, who is interested in Martian mineralogy and geochemistry, defended her thesis in June. Working with Assistant Professor Steven Chemtob, she conducted a series of experiments to study ultraviolet photooxidation of ferrous iron smectite clays. Because clay minerals formed by chemical weathering on ancient Mars were likely ferrous, her experiments could have profound implications for the interpretation of Mars’ mineralogical record and climate history.

She and Chemtob traveled to Brookhaven National Laboratory to conduct measurements on her treated smectites at the National Synchrotron Light Source II in July 2017. Her analysis reveals surprising differences between the mineral signatures of photooxidation and chemical oxidation, which she presented at the 2018 Lunar and Planetary Science Conference in The Woodlands, Texas, and won an LPI Career Development Award to support her conference travel. She will begin her PhD studies at Stony Brook University this fall.

EES research continues to grow

New research grants supported by the DOE, EPA, NSF, Pennsylvania Department of Transportation, William Penn Foundation, and collaborators in the geothermal industry have been won by EES faculty. The research includes: geothermal energy exploration in the western United States, the impacts of solar photovoltaics on environmental systems, glacial dynamics in Antarctica; urban hydrology in Philadelphia; efforts to recruit/retain/support earth science majors; and collaborations with Temple University’s Psychology Department to improve how students learn to think in three-dimensions.

In addition, during his sabbatical this fall Associate Professor Dennis Terry will study the paleopedology of the Piedra Chamana Fossil Forest in Peru.

Student and faculty research presentations

Students presented their research findings at a wide variety of local and national meetings this past academic year: 28 Geological Society of America; 11 American Geophysical Union; 1 Lunar and Planetary Science; as well as invited talks by faculty and students domestically and abroad in China, Iceland, Israel, Indonesia and South Africa.

Active researchers continued from page 1

Funded by the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory, the goal is to develop crop-centric co-located crop-solar PV systems to maximize the efficiency of agricultural land use—as well as provide co-benefits to theses rural areas with no grid accessibility, including rural electrification and energy for processing agricultural commodities locally and, thus, local jobs. Chong presented his results at the American Geophysical Union meeting last December. Ravi has been invited to speak on this and related work domestically and abroad in China, Iceland, Israel, Indonesia and South Africa.

Western U.S. Geothermal Research

Two research projects led by Nicholas Davatzes, EES chair and associate professor, to improve the renewable energy resource base in the United States will involve new MS students. Drew Spake will work with the Washington State Department of Natural Resources to oversee the drilling of four temperature gradient wells to prospect for new geothermal resources in the Cascades Mountains as part of a DOE-funded project. Kyle Bullins will investigate how stress and fractures control the behavior of the geothermal reservoir at Blue Mountain, Nevada, as part of an internship with AltaRock Energy Inc.

They will both be collaborating with Mike Swyer who joined AltaRock after graduating from Temple in 2012.
EES part of Thwaites Glacier research team

As part of a U.K.-U.S. research team, Assistant Professor Atsu Muto recently won two five-year NSF grants to return to Antarctica. He will study the impact on sea levels of the Thwaites Glacier, which currently accounts for about 4 percent of global sea level rise.

Nyquist and Toran celebrate two decades at Temple

Professors Jonathan Nyquist and Laura Toran both came to Temple in 1997 after 11 years at the Oak Ridge National Laboratory.

As a research scientist there, Nyquist used near-surface geophysical methods to characterize environmental hazards at DOE and DoD sites across the country. At Temple, with funding from NSF, EPA, DOE, and DoD, Nyquist has continued to research environmental problems such as cavity detection in karst terrain, groundwater-surface water interaction in lakes and streams, and urban stormwater runoff and infiltration.

To do so, he often employs terrestrial LIDAR (light detecting and ranging) technology to create 3-D models so precise they can identify surface contour variations down to millimeters. “It’s an amazing tool,” says Nyquist. “It’s really changed the game for microtopography mapping.”

He also has served as department chair, editor-in-chief of the Journal of Environmental and Engineering Geophysics, and president of the Environmental and Engineering Geophysical Society. He has received the Dean’s Distinguished Teaching Award, the Provost’s Award for Innovative Teaching in General Education, the EES Gold Medal Award and the Society of Exploration Geophysicists’ Harold Money Award. Nyquist also currently directs the university’s General Education Program.

Toran was a Wigner Fellow and research associate at Oak Ridge who studied fracture and karst flow and contaminant transport.

At Temple, with funding from EPA, NSF, PennDOT, and William Penn Foundation, Toran has pioneered studies of urban and karst hydrology, including evaluation of stormwater control measures and the interactions between groundwater and surface water through continuous monitoring and hydrogeophysics. These studies address the critical 21st century problems facing growing cities and populations.

“I initially had some hesitation about coming to Temple to study the urban environment,” says Toran, “but it has ended up being a rich topic that’s full of questions—and students are really interested in it.”

Toran is the Weeks Chair in Environmental Geology and has served as director of the Environmental Science Program. Her numerous awards include the Dean’s Distinguished Teaching and Mentoring awards, the University Service award and Fellow of the Geological Society of America. She also spent a year as an NSF Program Officer of Hydrologic Sciences.

A report to PennDOT on stormwater research along I-95, on which Toran was the lead author, recently won an award from the American Association of Highway and Transportation Officials for “high value research”—one of just four projects in the Northeast U.S. to be so honored. Toran’s research team includes faculty from Temple’s EES, Civil Engineering and Landscape Horticulture departments and Villanova University’s Civil Engineering Dept.

NEWS BRIEFS

NEW NSF GEOPATH GRANT TARGETS UNDERREPRESENTED STUDENT GROUPS

Rutgers and Temple universities are the lead institutions on a new NSF GEOPATH education grant. The goal is to attract freshmen and sophomore students from underrepresented groups to the geosciences by providing a two-week field experience at the Shale Hills Critical Zone Observatory in central Pennsylvania.

NEW ENVIRONMENTAL PROFESSIONAL TRAINING CERTIFICATE

EES just launched a new four-course environmental professional training certificate. A key element: HAZWOPER training by Adjunct Professor Steve Peterson, BS ’10, MS ’14. This training allows students to immediately start work on hazardous waste sites when they get jobs in environmental consulting. The standard safety training is supplemented with additional topics identified by a survey of alumni as critical to enhancing job preparation. This certificate’s development was partially supported by an NSF GEOPATH grant, which funded such supplies as a clean 55-gallon drum for training exercises.

CAREER NIGHT

GEOPATH hosted a career night in March to introduce majors to recently employed EES alumni. The alumni explained the job search process, interviewing and what they do on the job. Many thanks to the alumni volunteers: Matthew Jiniec, BS ’12, (Kleinfelder); Anthony Marianni, BS ’09, (PWD); Julie Mui, BS ’15, (Criterion Labs); Chris Oest, BS ’13, MS ’15 (Arcadis); Heather Rychlak, BS ’15, (CH2M Hill) and Christopher Witzigman, BS ’16, (USGS)

NEW HONOR SOCIETY

Theta Rho, the Temple University chapter of The Society of Sigma Gamma Epsilon (SGE), the National Honor Society for the Earth Sciences, was established in the spring of 2017. Since then, Theta Rho has offered professional development activities such as resume preparation and networking, geology field camp preparation and graduate school applications. With more than 30 members and a growing body of alumni, Theta Rho continues to improve the EES student experience.
GEOLLYWOOD GENERAL EDUCATION COURSE A BLOCKBUSTER

One of EES’ general education courses, “Disasters: Geology vs. Hollywood,” was featured on the Temple Now website as one of Temple’s 12 coolest classes. “There’s something special about watching a Jeep successfully drive over flowing lava,” the story noted. “What we love more is that this class will teach us if stuff like that can actually happen in real life.” Spoiler alert: It can’t!

CATSKILLS TRADITION CONTINUES

Once again, students taking the “Paleontology and Stratigraphy,” “Structural Geology,” and “Soils” courses spent three days this spring learning about the geology of New York’s Catskills region. Over the past two years, EES has also sponsored a field trip barbeque spearheaded by Adjunct Professor Steve Peterson, BS ’10, MS ’14. A new overnight fall field trip is now being led by Assistant Professor of Instruction Jesse Thornburg for students in Sedimentary Environments.

FIELD CAMP STUDENTS NEED YOUR SUPPORT

Fourteen junior and senior BS geology majors completed their field camp experiences in summer 2017. EES sent representatives to eight different field programs across the U.S., as well as two international experiences in Ireland and South Africa. As in previous years, the students’ field camp experiences were generously supported by proceeds from the Geology Club rock and jewelry sale, the CST Undergraduate Research Program and contributions to the Gene C. Ulmer Student Fund.

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