Chair’s message

During this challenging year, we worked hard to build learning experiences and connections in a virtual environment. New courses, such as the general education course *Hidden Figures to Gamergate: Race and Gender in STEM*, were built for this new world. Other classic courses were rebuilt. And after a fall of careful separation, this spring we returned to limited in-person instruction and voluntary field trips.

Throughout it all, our scientific work continued in homes, in the lab and in the field.

We have designed new concentrations in environmental science that allow students to tailor their expertise to the issues, problems and careers they want to pursue.

New work toward sustainable environments by students and faculty is being fueled by major grants, including: Sujith Ravi’s NSF CAREER grant to study the role of photovoltaics on the food-energy-water nexus; Bojeong Kim’s NSF award to investigate how impurities in manganese oxides affect their interaction with the environment; and Atsuhiro Muto’s NSF-supported work to understand how substrates affect Antarctic ice shelves, which has earned him tenure and promotion.

Thanks to our alumni and friends whose support has contributed to the department’s growth. Our heartfelt condolences to those who left us in this difficult year. Please visit, join a seminar or thesis defense via Zoom, meet current students and faculty and see how we are growing.

Nicholas C. Davatzes
Associate Professor and Chair

david.etemple.edu

Bojeong Kim’s NSF grant focuses on manganese oxides in the environment

Since summer 2020, Assistant Professor Bojeong Kim has been working on a three-year National Science Foundation grant to examine how impurities in hausmannite and manganite—the most common lower valent manganese oxides in the environment—affect the minerals’ properties, reactivity and stability.

“In the natural environment, most minerals contain some degree of impurities,” says Kim. “Understanding the role of these impurities is really important to understanding how these minerals behave in nature.”

So far, Kim’s research indicates that impurities in the structure of these two manganese oxides makes them stronger oxidants capable, for example, of effectively oxidizing arsenic to reduce its toxicity.

“Therefore,” she says, “laboratory experiments with pristine minerals may not closely reflect the heterogeneity and complexity in natural settings.”

Although hausmannite and manganite are widely used in important industrial applications, including in batteries, other energy storage devices and sensors, the minerals are often understudied in the field of environmental geochemistry.

In addition to Kim, PI, the $487,000 project’s researchers include Elizabeth Cerkez, assistant professor of instruction in the Chemistry Department, and Evert Elzinga, associate professor in the Department of Earth and Environmental Science at Rutgers University.

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You can contribute to the continued success of the Department of Earth & Environmental Science by supporting scholarships, undergraduate research and innovative programs. Make your gift at giving.temple.edu/ees.
Boyoung Song, one of EES’s first PhDs, now postdoctoral researcher in Vienna

Boyoung Song, CST ‘20, one of the first three students to earn a geosciences doctorate at Temple, is a postdoctoral researcher at the University of Vienna. At Temple, Song’s research of hausmannite, a common yet under-studied low valant manganese oxide, resulted in three papers; two published and one accepted for publication.

“My advisor, Assistant Professor Bojeong Kim, was my biggest supporter,” she says. “At Temple, I had so many hands-on experiences with many analytical tools essential for analyzing natural and laboratory samples, including inductively coupled plasma optical emission spectroscopy, ion chromatography, X-ray diffraction and electron microscopes.

Song believes that the analytical skills she acquired were critical in obtaining her postdoctoral fellowship. She is working on a project funded by the German Environmental Protection Agency to understand the dissolution and transformation behavior of engineered metal nanoparticles in aquatic environments.

Ultimately, she hopes to join a national laboratory as a geochemist.

Hannah Feldman is a rock star

Hannah Feldman, CST ‘21, a dual geology/environmental science graduate, is literally a rock star. The recipient of CST’s Molnar Award—given to an outstanding graduating female in geology or chemistry—was the Earth and Environmental Science Student Advisor and Advocate and president of Temple’s Sigma Gamma Epsilon earth sciences society chapter.

While at Temple, she worked on a citizen science project with Associate Professor Alix Davatzes and performed microfossil research with Professor of Instruction Allison Tumarkin-Deratzian. Feldman also assisted on a department project to increase diversity and inclusion in the geosciences by exploring ways to provide a more inclusive and affordable alternative to every geology major’s required field camp capstone experience.

“I’m really passionate about it,” says Feldman. “I personally struggled looking for a field camp because I need disability resources and I am a queer woman.”

Interested in emergency management, Feldman began a one-year stint with FEMA Corps, a joint program of FEMA and AmeriCorps.

Andrew Bentley helped Pitt pivot to remote learning

While earning his master’s degree in geology, Andrew P.K. Bentley, CST ‘13, discovered he enjoyed education just as much as research. Since 2019—after earning a PhD in science education and geoscience from Western Michigan University—he has been an award-winning instructional designer at the University of Pittsburgh’s Center for Teaching and Learning.

“At Temple, I became enthralled with figuring out how I could help my students more deeply comprehend science,” says Bentley, who had earned dual BS degrees in both geoscience and earth and space science education at West Chester University. “I began helping other teaching assistants who did not have education backgrounds.”

At Pitt, as the pandemic struck, he assisted hundreds of faculty to switch to remote instruction and helped the nursing faculty build evidence-based online courses for degree and certificate programs. He was charged by the Provost’s Office to provide instructional design support for “Anti-Black Racism: History, Ideology, and Resistance,” a required first-year course. “COVID-19 made what I do more valuable,” he says.
EES increases focus on sustainability

In curriculum and research, the EES Department is focusing more on environmental science and sustainability.

A year ago, Assistant Professor Sujith Ravi received a prestigious five-year, $506,000 NSF CAREER AWARD to research the socioeconomic and environmental co-benefits of using the same acreage to produce both solar photo-voltaic (PV) energy and agricultural products.

“As we progress from fossil fuels to a more renewable energy future, the question is, ‘How can we make renewable energy more sustainable by using less land and water?’” says Ravi, who is also funded by the Department of Energy. “As the population increases, increasing energy and agriculture demands are competing for those same resources.”

Building upon his previous research in the U.S., India, and Indonesia, Ravi is investigating how to best combine solar panels with shade-tolerant crops or biofuel sources growing underneath the panels.

As part of his NSF grant, Ravi is establishing an experimental “agrivoltaic” site at the Temple Ambler Field Station complete with a sensor network to precisely measuring the entire process—solar panel efficiencies, weather factors and soil moisture. The site will provide a unique opportunity for data collection, model testing, industry cooperation, public outreach and farmer technology demonstrations.

The grant also provides for high-school STEM-teacher workshops, first generation and/or underrepresented students research opportunities, and development of an interdisciplinary undergraduate energy and the environment course.

Professor Laura Toran, an urban hydrologist, says, “Sustainability has always been my research area. But I do sense more collaboration and more people getting involved, both at Temple and throughout the region and the country.”

Toran is participating in an NSF-funded research project with researchers at six East Coast universities and U.S. Geological Survey. Their goal: to investigate how earth processes, such as water infiltration, weathering and chemical interactions, in urban stream environments from Philadelphia to North Carolina differ from forested zones. Toran, whose portion of the five-year grant is $228,000, is investigating the Pennypack Creek.

“I have previously studied the creek in Philadelphia,” she says, “but the fact that this involves comparative research of different urban streams, and with people with different specialties and different universities sharing resources, concepts and ideas, will make our findings more powerful.”

Muto probes impact of Antarctica ice melt on global sea-level rise

Atsuhiro Muto, granted tenure and promoted to associate professor in May, is the recipient of a third straight NSF grant to better understand the movement and melt rates of a massive Antarctic glacier and adjacent ice shelves and their impact on sea-level rise.

The first two grants, which totaled $530,000, funded Muto’s collection of data regarding the sea bed levels and geology underneath Thwaites Glacier and its ice shelves. The latest grant, in collaboration with Columbia University, totals $174,000 over three years for Muto’s lab.

“This grant funds our efforts to digest all the data and feed it into ice-sheet models to improve our predictions for future sea-level rise,” says Muto, who has conducted research in Antarctica seven times. “The geology beneath the glacier determines how fast the ice can move toward the ocean. And ice shelves are playing an important part in holding back a tremendous amount of ice.”

The Thwaites Glacier is the size of Florida. If it melts in the coming centuries, current modeling predicts it could raise the global sea level more than two feet. This could, in turn, trigger the collapse of the entire West Antarctic Ice Sheet, which would result in the global sea level rise of approximately 10 feet.

Liz Cushman plugs abandoned oil wells

Since oil was discovered in Titusville, Pennsylvania, in 1859, hundreds of thousands of wells have been drilled in the state. Since earning her master’s in geology, Liz Cushman, CST ’19, has been plugging some of the most troublesome abandoned wells.

“Using oil and gas well statistics and GIS, my primary tasks involve providing insights into leaks from plugged wells, well construction trends, underground gas storage wells, well plugging techniques and emissions from legacy wells,” says the licensed professional geologist with the Pennsylvania Department of Environmental Protection’s Bureau of Oil & Gas Management. “It’s nice to know that I am, hopefully, making small changes to improve the environment for everyone in the state.

“A lot of my job entails data analysis and communicating the results of those analyses to my colleagues,” she adds, “and all the courses at Temple really supported my development of those skills.”

FACULTY NOTES

Allison Tumarkin-Deratzian, vice chair of the EES Department, has been promoted to full professor of instruction—EES’ first professor of instruction.

Jesse D. Thornburg, assistant professor of instruction, received a $8,200 instrumentation grant from Campbell Scientific to fund two meteorological towers to be used by students across several EES courses.
Farewell, ‘geo momma’ Shelah Cox

Administrative assistant Shelah Cox—a fixture at the Geology/EES Department since 1989—retired in May after working 47 years as a full-time Temple University employee.

“I’m 65 and it’s time to go, but I really hate to leave my students because they’ve been an inspiration to me,” she says. “I have my own children, but I was glad to be able to mentor the students, to help them out however I could, whether it was a hug or a pep talk.”

When she began with the department, she recalls no diversity among the faculty or student body. But then, international students from Africa, Asia, India and beyond began to enroll. “Christian Obasi, CST ’08, from Nigeria is only one of the many international students who have received their PhDs.”

Obasi earned his master’s from Temple and a doctorate from the University of Oklahoma in 2018.

Cox adds that, “We had international and domestic students wanting to quit the program. After tears and a lot of talking, I was able to convince many of them to stay and keep trying, and many did.

“A lot of them call me ‘geo momma’ because they are my geo babies. I just love them.”

New degree concentrations in environmental science bachelor’s

Beginning this fall, new environmental science majors will be able to select one of four areas of concentration.

“It gives students the flexibility to get a broad interdisciplinary degree and bring depth into one field that they are particularly interested in,” says Associate Professor Sujith Ravi, director of the environmental science program, who led a year-long, faculty-wide effort to create the concentrations.

“Our students are very employable,” adds Ravi. “But specializing increases their employability by adding more skills, and gives them a competitive advantage for graduate school.”

The concentrations are:

• **Climate:** This concentration teaches the science and tools used to assess the changing climate and opportunities to mitigate its impacts on human societies and environmental systems. Students will learn essential attributes of resilient environments, infrastructure and sustainable resource management.

• **Applied Ecology:** This concentration includes interdisciplinary coursework in biology, geology, chemistry and mathematics, combined with classes from geography and economics to explore the relationships between living things and their environment.

• **Hydrology:** This concentration offers coursework in geosciences, biology, chemistry, plus hydrology to train students in environmental monitoring approaches for tackling environmental problems.

• **Environmental Geochemistry:** Students completing this concentration will understand fundamental principles that control the composition and reactions of water and materials—including contaminants that may affect environmental and human health; learn and practice methods for collecting and interpreting geochemical datasets; and integrate such datasets into assessments of environmental change.