LEHIGH UNIVERSITY

DEPARTMENT OF
EARTH AND ENVIRONMENTAL SCIENCES

2025 Newsletter

2025 EES Field Camp in the Badlands of Wyoming

DEPARTMENT OF
EARTH AND ENVIRONMENTAL SCIENCES
2024-2025

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John Paul Balmonte
Gray Bebout
Bob Booth
Ben Felzer
Katie Hemmerlin (adjunct)
Kelly McCartney (VAP)
Jill McDermott
Anne Meltzer
Beth Norman (VAP)
Frank Pazzaglia
Steve Peters
Joan Ramage
Dork Sahagian
Michelle Spicer
Meredith Townsend
Peter Zeitler

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Our Mission

We study the Earth and environment, how the solid earth, oceans, atmosphere, and life interact to shape the world in which we live. Our research is incorporated into field-based, experiential, multidisciplinary education and integrates observational, experimental, theoretical, and numerical approaches. We seek to instill in our undergraduate and graduate students the critical thinking, quantitative, and communication skills needed to succeed in life. Engagement with diverse perspectives and people enhances our research and is integral to educating our students. We seek to enhance earth science literacy through academic and outreach activities so that individuals and communities can make informed decisions about land use, biodiversity, resources, hazards, and climate change.

Message From the Chair

Message From the Chair

Greetings from the Department of Earth and Environmental Sciences!

When I arrived as an assistant professor in EES back in 2005, I received a shipment of old geology textbooks from my uncle, who graduated from Lehigh University with a BA in geology in 1955. The textbooks were those he used during his studies. Looking through them, it was astonishing to see the magnitude of change that had occurred in fifty years - scientifically, pedagogically, and culturally. Fast-forward twenty years to 2025 and the pace of change is more astonishing, with computational and technological advancements regularly transforming our research, pedagogical innovations diversifying the ways that we teach, engage, and retain students, and a diversity of perspectives and people now enhancing our research, teaching, and outreach efforts in unprecedented ways. Times of rapid change inevitably come with both challenges and opportunities, and during my twenty years at Lehigh I have been continually impressed by the EES department's ability to navigate challenges and to creatively identify and pursue new opportunities. It is a privilege to be part of an innovative and forward-thinking department with a deep history of success at the university, and it is an honor to now serve as department chair. The coming years will certainly be even more dynamic than the last twenty, and I am excited to collaboratively work with faculty, staff, students, and alumni as we build and expand our world-class research programs, teach and inspire the next generation of students, and tackle emerging challenges and opportunities.

In this newsletter, we share news and some of the activities of the department during the past academic year. We hope you enjoy this update and the many pictures of your department in action!

The EES department continues to broaden its intellectual footprint, conducting internationally recognized scholarship and research across a range of topical areas in the Earth and environmental sciences. Four early-career faculty brought novel research to our portfolio, including externally funded projects examining how glaciers and ice sheets impact volcanic behavior (**Meredith Townsend**), the effects of pressure on organic matter degradation by microbes in the deep ocean (**JP Balmonte**), the dynamics of Pacific Ocean circulation during the warm Pliocene Epoch (**Jordan Abell**), and the distribution and organization of microbial communities in tropical rainforests (**Michelle Spicer**). Other recently initiated projects include developing techniques to recover rare-earth minerals from coal-combustion residual wastewater and solid wastes (**Steve Peters**), understanding mechanisms and consequences of tectonic uplift in continental interiors (**Frank Pazzaglia**), detecting snowmelt timing in remote regions using satellite data (**Joan Ramage**), examining subduction zone complexity in the northern Ecuadorian forearc (**Anne Meltzer**), investigating patterns of nitrogen cycling across redox gradients at deep-sea hydrothermal vents (**Jill McDermott**), and developing garnet oxygen isotope records of devolatilization and fluid flow during ultrahigh-pressure, subduction-zone metamorphism (**Gray Bebout**).

Peter Zeitler worked with **Bruce Idleman** to finish up laboratory analyses in his geochronology lab as part of several NSF grants, before decommissioning his laboratory so that **Jordan Abell** could start building his lab in that space. **Gray Bebout** took a much-needed sabbatical to work on manuscripts and proposals, after five years of serving as department chair. Gray's thoughtful leadership saw the department through the pandemic and our recent, very successful faculty searches. Thank you, Gray! Our faculty continue to win awards and recognition for their research programs; for example, **Jill McDermott** won Lehigh's *Libsch Early Career Research Award* and **JP Balmonte** earned a *Class of '68 Fellowship*. **Ben Felzer** received an *Associate Professor Career Research Enhancement Award* from the College to support his work estimating the global terrestrial carbon sink. EES also remains a destination for visiting scientists, and this spring **Dork Sahagian** organized and hosted a very successful and well-attended international workshop on bubble nucleation in magmatic systems. It has been a very busy and productive year.

Message From the Chair

Much of our research efforts continue to be moved forward by a committed and energetic group of graduate students and post-doctoral scientists, and our students routinely receive recognition and awards for their work. **Juan Felipe Bustos Moreno** was awarded the Dean's Graduate Student Research Award, **N. Miller** received a CAS Summer Research Fellowship, and **Nora Vaughan** was awarded a Fall Semester Dean's Fellowship. Two postdoctoral scientists, **Franziska Keller** and **Alexander Wickham**, are making significant contributions to research projects and infusing ideas and energy into our activities. Our graduate students organized and led our annual Graduate Research Symposium in March, and this stimulating day-long celebration of research is described more in this newsletter. Alumni are welcome and encouraged to attend this annual event!

EES faculty continue to be among the best educators at Lehigh, actively incorporating modern pedagogy into their classes and involving students in field experiences and other forms of experiential, hands-on learning. Our EES Field Camp once again travelled from Pennsylvania to the Rocky Mountains using the natural world as a laboratory to integrate and apply knowledge in the earth and environmental sciences. Alumni often comment that field camp had a transformative impact on them, and by all accounts the camp continues to have this effect. Major efforts to modernize aspects of field camp have been spearheaded by director **Steve Peters** over the past couple years, and you can read his summary of this year's activities later in this newsletter. You will also see examples of how experiential education is infused across our curriculum, from our introductory, non-major courses to our upper-level undergraduate and graduate courses. These efforts have also been coupled with increased community engagement; for example, **Anne Meltzer** has led the development and implementation of our new SEEDS program, which has been developed in partnership with Broughal Middle School and allows our EES majors and minors to engage in science and sustainability issues with middle school students.

EES faculty also continue to be campus leaders and highly involved in the operation of the university. **Peter Zeitler** is chair of the Faculty Senate, **Joan Ramage** is Faculty Director of the ADVANCE Center, **Frank Pazzaglia** is director of Academic Planning for the College, **Jill McDermott** is director of Lehigh Oceans Research Center, and **Ben Felzer** is deeply involved with the new Center for Catastrophe Modeling and Resilience. We continue to strive to integrate EES into the strategic plan of the university and the academic life of all students, as well as engage with the broader Lehigh Valley community. Check out our recent *Changemakers* event in this newsletter for a nice example of how we are working to bring together and build community around the themes of sustainability and environmental challenges.

This year brought more changes to the makeup of the department. **Dave Anastasio** and **Bruce Idleman** both retired, after decades of service to the university. Dave taught his last structural geology class in the spring of 2024, a well-loved course that has provided a critical foundation for generations of Lehigh EES students. Bruce has been a major contributor to the research productivity of the department, and his technical expertise is impossible to replace. They are both still finishing up research projects, so we get to occasionally see them around the STEPS building; however, their impact will be deeply missed, and we wish them both the best in retirement. Check out the pictures from their retirement celebrations in this newsletter. We have hired a new business manager, **Jamerson Baynard**, and a new laboratory facilities technician, **Jessica Melhorn**. **Beth Norman** joined us for 2024-2025 academic year as a Visiting Assistant Professor (VAP), and **Kelly McCartney** will join us as a VAP this fall.

Thank you to all our alumni for their support! Alumni donations have been critical to our success and will almost surely be increasingly important given the uncertainty in federal science funding. Our endowments and gift accounts have allowed us to enhance and develop our educational and research missions in creative and transformative ways. Alumni funds directly provide experiential opportunities for undergraduate and graduate students, support for research projects, professional development opportunities for students and faculty, and resources for our annual seminar series, symposia, and workshops. Many of these activities are highlighted in this newsletter. This year, EES received two new particularly impactful gifts. One is a new endowment fund - The John McGarry Endowment Fund for Sustainable Initiatives and Earth & Environmental Sciences. **John McGarry '61 '62** earned a BA in '61 in Applied Sciences and a BS in '62 in Metallurgy & Material Engineering. Fifty percent of the distribution of this new endowment supports EES, and the other 50% supports the Office of Sustainability. **Bob Scamman '77 '81G**, who completed his M.S. in the department in 1981 working under **Bobb Carson**, also established a generous gift account to support the department. In conversations that I had with Bob; he relayed a fun story highlighting how EES faculty and graduate students have long been resourceful and dedicated!

> *"I remember a storm in Bethlehem while I was in graduate school. Lots of snow and we couldn't get word on whether the campus was open. So, I called Bobb Carson's house and Joan told me that Bobb had left on his cross-country skis for campus. I got the word out to other grad students, and we may have been the only class to meet that day!"* – Bob Scamman

Interested in getting involved with your old department? Or just letting us know what you are up to? Please reach out to me. We have many events throughout the year that are great opportunities for alumni to visit or engage with the department, including our Friday lunches and seminar series, the graduate symposium, the undergraduate symposium, course field trips, and field camp. Most of our routine alumni outreach is now through LinkedIn, so please follow us there!

Best Wishes,

Bob Booth
Professor and Chair, EES Department

EES Lehigh University

LinkedIn

Undergraduate Symposium

Undergraduate Research Symposium, May 2025

Our 2025 Undergraduate Research Symposium was a fantastic event highlighting the broad range of exciting research projects that EES undergraduates completed during the past year. A keynote talk was given by alumnus **Phil Stevens '23**. Phil's interesting career path has taken him into the growing field of critical mineral exploration and development. Phil's story highlighted that EES graduates should follow their passions, and in Phil's case this involved exercising his entrepreneurial spirit and becoming his own boss.

Pictured to the left are EES undergraduate student award winners with alumnus Phil Stevens. **Adelaide Schiller** (left) won the *Handwerk Award*, which is given to a student for outstanding achievements in the field of Chemistry, Material Science and Engineering, or EES. **Rory Bertoldo** (second from left) earned the Donnel *Foster Hewett Award*, which is given to an outstanding EES senior who best demonstrates potential for career excellence. **Ryleigh Schultz** (third from left) received the *Munford Award*, which is given to an EES senior that demonstrated substantive improvement over their course of study, and as a senior has achieved a clear record of excellence. Congratulations to all our 2025 EES Award winners!

Student Presentations

Undergraduate Symposium

Rory Bertoldo (Honor's Thesis)
Cyclostratigraphic analysis of a rhythmically bedded lacustrine deposit, Khyargas Nuur, Great Lakes depression of western Mongolia
Advisor: Frank J Pazzaglia

Elle Burke and Becca O'Brien
Caribou Migration and Snow Melt: Observations from the Bluenose East and Beverly Herds, NWT, Canada
Advisor: Joan Ramage

Karen Defino
Historical Nitrogen Isotope Trends in Sphagnum from the NJ Pine Barrens: Insights from Herbarium Specimens
Advisor: Bob Booth

Camille ElChaar and Adelaide Shiller
Air Quality in the Lehigh Valley
Advisor: Ben Felzer

Rose Falletta, Amelia Jones, Annalise Thapaliya
Optimizing greenhouse conditions for tropical plant success
Advisor: Michelle Elise Spicer

Kyla Richards and Miranda Chiong
Germination rates of greenhouse-grown native herbaceous plants
Advisor: Michelle Elise Spicer

London Diiorio
Abiotic Influences, Biotic Players, and Biogeochemical Consequences of Animal Decomposition
Advisor: JP Balmonte

Elise Grass
SAR Imaging Analysis of the January 2025 Glacial Flooding Event on the Vatnajokull Glacier in Iceland
Advisor: Joan Ramage

Lauren Hagerty
Characterization of Rare Earth Element Occurrence in Coal and Ash Phases using SEM-EDS
Advisor: Steve Peters

Blythe Kratzer
Construction of a paleomagnetic age model for the Zereg basin in western Mongolia
Advisor: Frank J Pazzaglia

Yuliana Lugo-Melendez
Carbon sequestration at the Sculpture Garden Watershed
Advisor: Frank J Pazzaglia

Bianca Palomino
Spanish-language website for the Lake Nockamixon interpretive sign
Advisor: Frank J Pazzaglia

Rheanna Patterson
Testate amoeba diversity and community composition in epiphytic bryophytes of a temperate rainforest
Advisors: Michelle Elise Spicer and Bob Booth

Amanda Pearson
Exploring the Relationship of Silica, Phosphate, and Temperature at Hydrothermal Vents: A Temporal Analysis
Advisors: Jada Siverand, Esmira Bibaj, Jessica Rodgers, Jill McDermott.

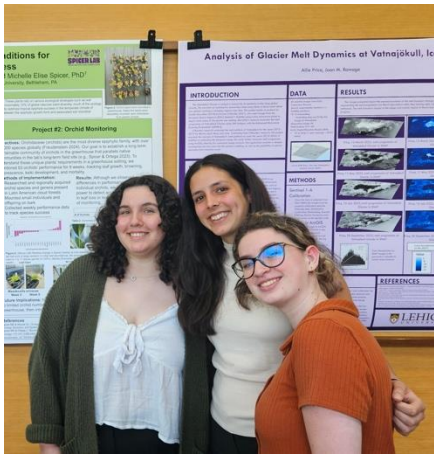
Allie Price
Analysis of Glacier Melt Dynamics of Vatnajökull, Iceland
Advisor: Prof. Joan Ramage MacDonald

Olympia Ransom
Microbial Enzyme Activities and Temperature Sensitivities in Association with Arctic Macroalgae
Advisor: JP Balmonte

SEEDS student group: Logan Chiles, Riley Chiles, Ellis Krush, Venecia Zaia and Kailey Alderfer
Sustainability Education and Environmental Development
Advisor: Anne Meltzer

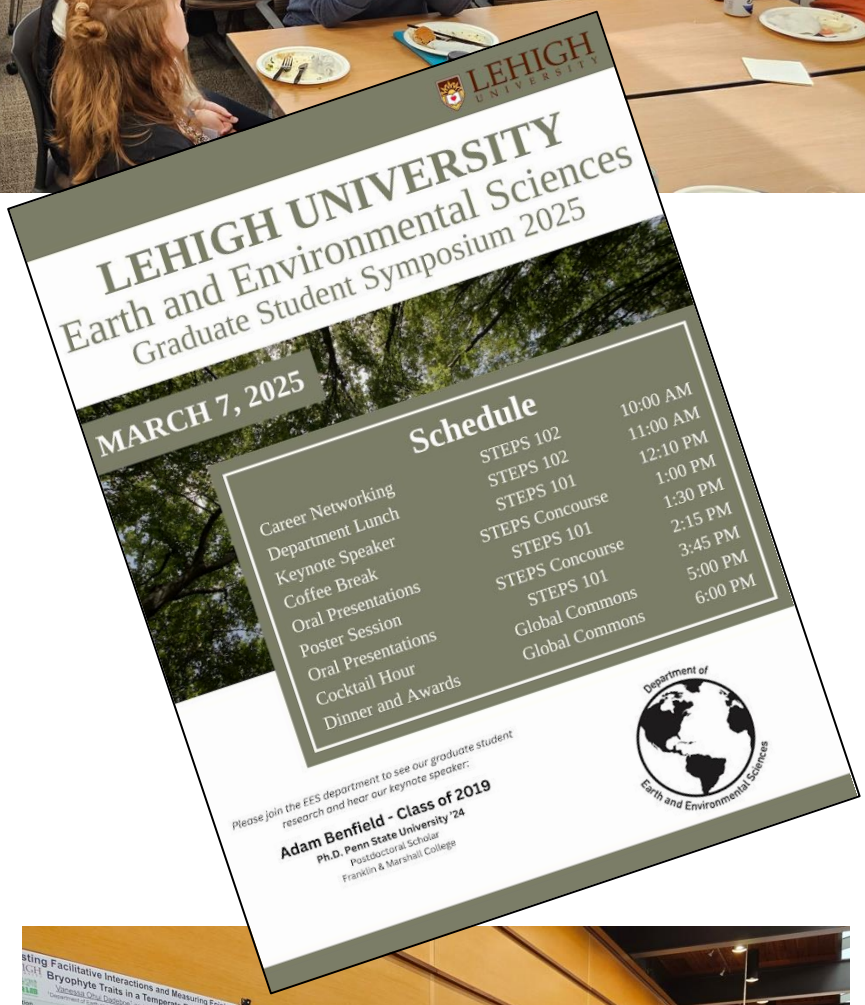
Congratulations to the EES Undergraduate Classes of 2024 and 2025!

Leia Barnes
Rory Bertoldo
Violette Bonvallet
Shreya Chawla
Julia Crawford
Ethan Davis
Tessa Dougan
Ashleigh Doyle
Sierra Drey
Abbey Duane
Patrick Edmondson
Anna Erickson
Elise Grass
Corey Harris
Three Henderson
Juliana Kilgore
Morgan Koch
Spencer Koski
Peter Levy
Anna Lewis
Tess McGinley
Margaret Mclaughlin
Olivia Memeger
Sophia Mihalek
Bianca Palomino
Rheanna Patterson
Adelaide Schiller
Ryleigh Schultz
Julia Stevens
Phil Stevens
Maddie Watts
Christian Williams
Venecia Zaia



Graduate Symposium

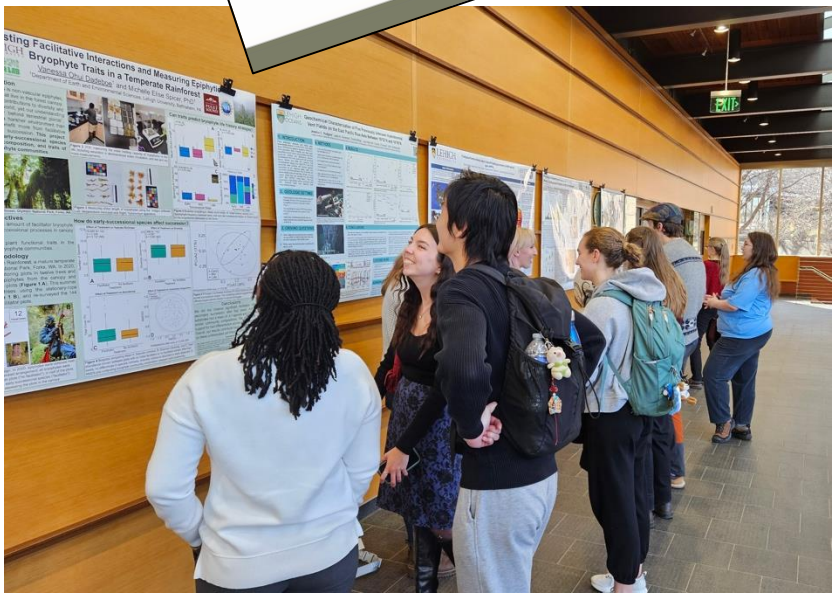
Graduate Research Symposium, March 2025



The 2025 EES Graduate Research Symposium was a great success, with a keynote talk by alumnus **Dr. Adam Benfield '19** entitled "Conservation paleoecological approach to rewilding buried river-wetland corridors in southeastern Pennsylvania." Adam earned his MS from Lehigh in 2019, a PhD from Penn State University in 2024, and was a post-doctoral scholar at Franklin & Marshall College at the time of the symposium. He has recently started a faculty position at Appalachian State University!

Seven oral presentations and thirteen poster presentations highlighted the breadth and significance of EES graduate research activities. After spending the day discussing the research of our graduate students, the event culminated with a dinner where the graduate instruction committee **(Jill McDermott**, **Ben Felzer**, and **Meredith Townsend**) gave out awards. We were thrilled that alumni **Alan Benimoff '84**, **Tom Becker '00**, and **Ashley Pastore '24** could attend many of the day's events along with **Emeritus Professor Bobb Carson**.

Our annual graduate research symposium is entirely planned and executed by our graduate students. Thank you to the Grad Symposium Committee - **Alexis Stansfield, Gabriela Ponce**, and **Aracely Garcia** - for all their hard work!



Student Oral Presentations

Noemi Schollmeyer
Year-Long, Weekly-Resolved Microbial and Biogeochemical Processes in an Arctic Fjord
(Advisor: J.P. Balmonte)

Fjord biochemistry weekly resolved
Tells us how the climate already evolved.
Our researchers think
Microbes are a sink.
Enzyme degradation is surely involved!

Esmira Bibaj
Hydrothermal Activity Along the Western Galápagos Spreading Center: Sampling Black Smokers 46 Years After the Discovery of Seafloor Hydrothermal Systems
(Advisor: Jill McDermott)

Black smokers are found at the base of the sea
Where MOR fluids can make a chimney.
The path of the crab
Tells which samples to grab.
And P-T conditions will then hold the key.

Michael Andramuño
Landscape response to deformation in the northern Ecuadorian forearc
(Advisor: Anne Meltzer)

The foreland of Ecuador has earthquake swarms
That show how the lithosphere nearby deforms.
The faults through a stream
Make knickpoints extreme!
A shifted drainage basin divide then forms!

Jada M. Siverand
Hydrothermal Fluid Chemistry of the YBW-Sentry Vent Field at 9° 54'N East Pacific Rise
(Advisor: Jill McDermott)

There's critters that hang around mid ocean vents
Community thrives at no solar expense!
When fluids emerge
The nutrients merge
And what we observe thus begins to make sense!

Mahboubeh Boueshagh
Uncovering a Surprising Correlation: A Novel Approach to Snow Water Equivalent Estimation Using Passive Microwave Satellite Data and Interpretable Machine Learning
(Advisor: Joan Ramage)

How much fresh water is contained in the snow?
Better use microwaves- we want to know!
Machine learning will tell
If it correlates well.
And SSD is now the new way to go!

Zhihong Huang
Electrodialytic Separation of Lithium and Rare Earth Elements (REEs) from Coal Combustion Residuals
(Advisor: Steve Peters)

You find some rare earths in our old CCR.
American ores are just not where they are.
So we burn the coal
Cuz it's how we roll.
But mining of fly ash seems truly bizarre!

Juan Felipe Bustos Moreno
Nitrogen enrichment during geochemical weathering of the Archean felsic crust
(Advisor: Gray Bebout)

Nitrogen comes if you weather old crust.
This is a point that is rarely discussed.
The minerals host
Ions they like most.
Eroded section provides it, we trust!

Presentation summaries by resident EES poet ***Dork Sahagian!***

Congratulations to **Zhihong Huang** for winning the best oral presentation and **N. Miller** for winning the best poster presentation!

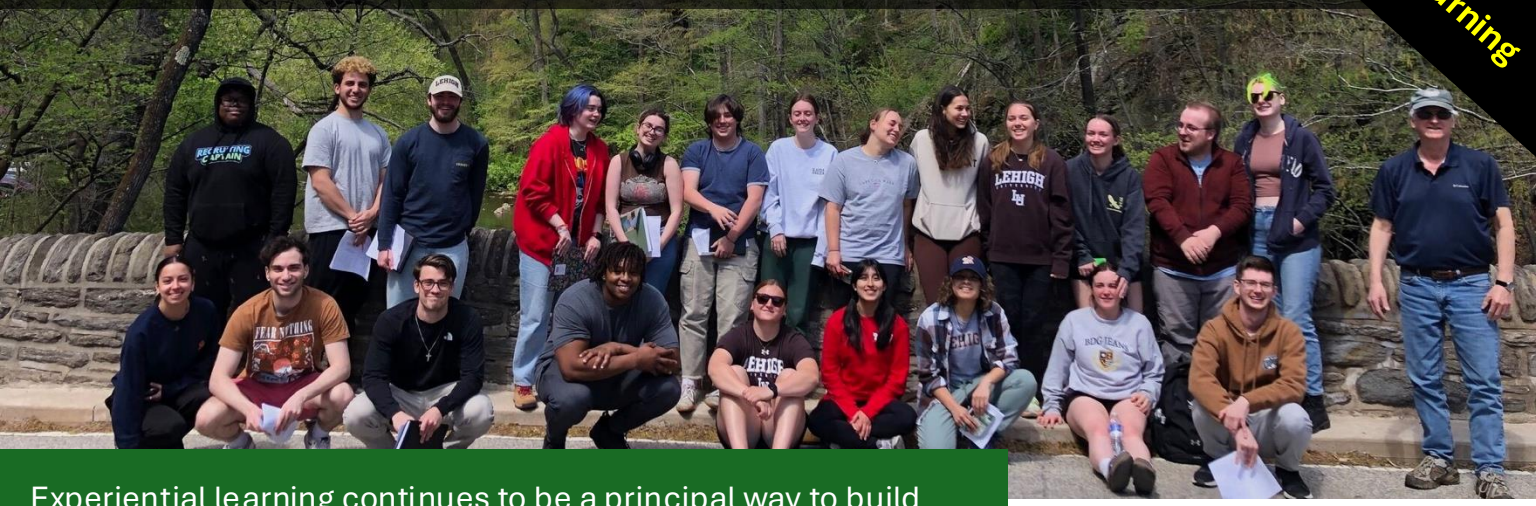
Student Poster Presentations

- Alexis Stansfield, ***Increased phototrophy in testate amoebae associated with recent warming on Alaska's North Slope.*** (Advisor: Bob Booth)
- Aracely Garcia, ***The Atacames Seismic Swarm: Insights into Earthquake Migration and Fault Reactivation.*** (Advisor: Anne Meltzer)
- Gabriela Ponce, ***Rapid Migration of Offshore Seismic Swarms and Seamount Influence Within and Downdip of the 2016 Ecuador Rupture Revealed by High-Resolution 3D Velocity Model and Earthquake Relocations.*** (Advisor: Anne Meltzer)
- Gianna Greger, ***Prodigious Pumice at Askja, Iceland: rhyolitic apatite geochemistry at MOR-hot spot setting.*** (Advisor: Dork Sahagian)
- Jessica Rodgers, ***Geochemical Characterization of Five Previously Unknown Hydrothermal Vent Fields on the East Pacific Rise Axis Between 10°02'N and 10°05'N.*** (Advisor: Jill McDermott)
- Jonathan Wallace, ***Age models and hypothesized integration reach for the Quaternary glacially- influenced watershed assembly, reversals, and incisions of the Middle Allegheny River, Western Pennsylvania.*** (Advisor: Frank Pazzaglia)
- Leia Barnes, ***Precipitation Frequency and Magnitude Are on the Rise; Is That Because of Humans or the Environment?*** (Advisors: Joan Ramage and Frank Pazzaglia)
- Matthew Gano, ***Vertical position determines the wood microbial community, function, and assembly process in a Panamanian lowland tropical forest.*** (Advisor: Michelle Elise Spicer)
- Naomi Miller, ***Small canopy gaps facilitate multispecies plant invasions.*** (Advisor: Michelle Elise Spicer)
- Nora Vaughan, ***Growth of Mongolian Altai encoded in sedimentologic and geomorphic markers with rates constrained by a paleomagnetic and rock-magnetic cyclostratigraphic age model.*** (Advisor: Frank Pazzaglia)
- Nyssa Notrica, ***Knickpoint propagation as a source of landscape fragmentation driving biodiversity in Pennsylvania.*** (Advisor: Frank Pazzaglia)
- Rebecca Mitchell, ***Well dressed xenoliths have a tale to tell about Hualalai Volcano, HI.*** (Advisor: Dork Sahagian)
- Vanessa Ohui Dadeboe, ***Testing Facilitative Interactions and Measuring Epiphytic Bryophyte Traits in a Temperate Rainforest.*** (Advisor: Michelle Elise Spicer)

Alumni: Consider attending next year's graduate symposium!
We would love to connect with you.

Scenes from the EES "Classroom"

Experiential learning



Experiential learning continues to be a principal way to build foundational skills and knowledge in EES. Our students learn by doing science in the field, laboratory, and classroom.

(above) **Gray Bebout's** *Rocks and Minerals (EES-131)* students on a field trip, where they examined exposures of the Wissahickon Schist that experienced the Taconic and Acadian orogenic events. The course teaches essential EES knowledge of Earth materials.

(left) **Anne Meltzer's** *Environmental Science and Sustainability (EES-102)* students implementing their native-plant landscaping project in front of the STEPS building, with the assistance of **Linda Zaoudeh**. Student-driven and project-based learning feature prominently in this course.

(right) On the first warm day in April, **Frank Pazzaglia** teaches his *Geology of War (EES-016)* class on the STEPS lawn. Non-majors in this introductory class gain fundamental geological and environmental knowledge, with a capstone field trip to Gettysburg each semester.

Experiential learning

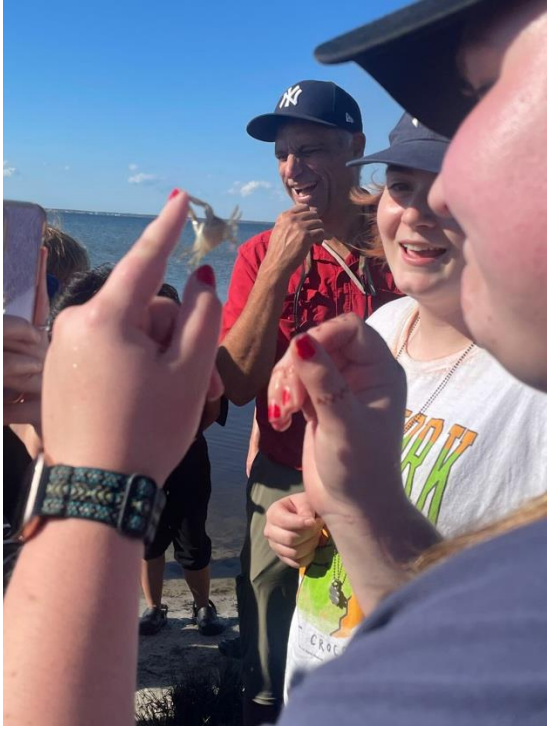
Bob Booth's *Wetland Ecology (EES-386)* students examining bog ecology, observing plant adaptations and distribution, and collecting a peat core extending back to the Late Pleistocene at Tannersville Bog. Paleoecological analyses were then performed back in the laboratory to reconstruct the developmental history of this unique place.

Experiential learning

Dork Sahagian incorporated both field experiences and project-based learning into his *Introduction to the Earth System (EES-080)* course, which is designed as the introductory course for EES majors. Photos of students (left) measuring discharge in Saucon Creek and (right) giving their final project presentations.

(below) Students from two of **JP Balmonte's** classes – *Global Changes, Microbial Forces (EES-034)* and *Marine Systems (EES-396)* – visited the United Nations Headquarters. The trip complemented and built on the global sustainability component of these courses.

Experiential learning



(above) **Frank Pazzaglia** and **Bob Booth** have been leading an annual field excursion to Island Beach State Park in New Jersey with their *Surficial Processes (EES-115)* and *Ecology (EES-152)* classes since 2006. Students develop an understanding of the dynamic physical and ecological processes that shape coastal environments and contribute to a longitudinal study of this dynamic landscape.

(right) Students in **Michelle Spicer's** introductory, non-majors course *Observing and Studying Nature (EES-025)* using motion-sensor camera traps to study animal diversity in the South Mountain forest. The course engages students with the natural world around them, coupling natural history knowledge and place-based learning with the development of data analysis and critical thinking skills.

Jordan Abell's introductory class, *Earth's Climate from the Dinosaurs to the Day After Tomorrow (EES-095)*, examined simulated ice core records to learn how ice-core based paleoclimate reconstruction works. Using synthetic ice cores with colored beads representing the hydrogen isotope composition, dust particles, and carbon dioxide trapped in the ice, students determined the local air temperature, planetary dustiness, and atmospheric carbon dioxide levels for the time interval encompassed in their ice core. They then combined their data with other groups to produce records of the climate system that span from the last ice age to today.

Experiential learning

Report from the field camp director

The 2025 Fieldcamp course (EES-341) once again embarked on its annual voyage of discovery, stopping at many familiar and famous locations. A focus this year was in moving the instructional modes to entirely electronic methods, with all the benefits and challenges that come with learning how to acquire data, make observations, and synthesize data in an electronic field notebook.

Students joined the camp from nine different institutions, dominated by Lehigh, which sent eight students. The long-time sending schools of Rutgers, University of Pittsburgh, University of North Carolina, The Commonwealth University – Bloomsburg, University of Maine, University of Miami, and Middle Tennessee State University loaned us another 16 students, bringing the total to 24 super-enthusiastic campers. Each university has slightly different instructional programs, but all students arrived with a solid foundation in the Earth Sciences. A common theme shared among all the students was a sense of adventure, desire for discovery, and a thirst for understanding how the Earth Systems work. Camp was instructed this year by **Steve Peters** and **Frank Pazzaglia**. They were assisted by a team of talented EES Graduate students and recent graduates, including **Nora Vaughan**, **Matthew Gano**, **Aurora Bertoldo**, and **Elise Grass**.

Students started on camp exercises before physically arriving for camp – by examining maps and materials and completing assignments related to the places we would soon visit and field exercises we would later complete. These pre-trip assignments succeeded in providing background and context so arrival on the field site was step 3 or 4 in the process instead of step 1. This made the learning process more efficient and allowed time to get to more advanced topics.

Check out this link for a recent CAS story on EES Field Camp

Fieldcamp still drives round-trip from Bethlehem to Idaho, taking advantage of the tremendous educational opportunities along that route. In Ohio and Wisconsin we observed glacial features, including glacial striations, lake sediments, and moraines. We hiked to the Devil's Lake overlook and touched the Great Unconformity, listening for Angels singing (according to Frank). We scampered through the hills of the Badlands, viewing the rich history of paleosols and fossils, and noting a fault or two amid the stunning erosional features. We visited a new campground this year in the Bighorn Basin, but are keeping its name top secret since it's too nice to share. The reconnaissance of Sheep Mountain never disappoints, except when it rains on bentonite haul roads, which luckily was not the case this year or last! From the Bighorns, we traveled west, camping with a sunrise view of the Teton Mountains. Students had a day for independent inquiry in the park, with the assignment of creating a succinct public information display.

Arriving in the Wildhorse River valley in Idaho, we spent a week camping in one of the most beautiful places on the planet. Students made observations of fluvial terraces and alluvial fans, and modeled diffusion of fault scarp profiles. Campers then discussed the interconnection of these processes across a wide range of time scales. The hike up to Boulder Canyon was a treat this year with the contributions of **Claudio Berti**, who helped lead the inquiry into the metamorphic core complex. Students crafted fully illustrated 3D block diagrams to summarize the processes of the core complex. The camp traveled to Yellowstone National Park near the end of the program, visiting highlights like the tuff cliffs, geyser basins, and the beautiful exposures along Firehole canyon drive. The Park's effort to repair the June 2022 flooding appear nearly complete, with evidence visible to the trained eye, but not to the typical park visitor.

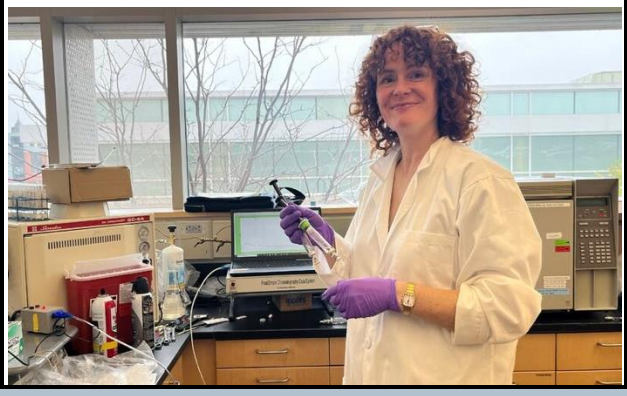
Camp still operates on a 6-7-8 schedule, for which you will either remember, or not. The bison of Yellowstone and Blue Mounds are still there, and the memories of each year are imprinted on the instructors and TAs. If you were a camper, I hope the experience has found a positive niche in your hearts and minds. All campers this year received some financial support to attend, but we'd like to offer that opportunity to all EES majors. We appreciate your support and look forward to a spectacular camp in 2026.

Steve Peters, Field Camp Director

Celebrating Faculty Success!

Joan Ramage's research with MS student **Mariah Matias** and undergraduate **Becca O'Brien** comparing snowpack conditions with the timing of caribou migration was featured in EOS. Check it out!

Jill McDermott won the Libsch Early Career award, which is presented by the university to a faculty member who is early in their career who has demonstrated the potential for high-quality research and scholarship. Jill was also awarded a collaborative three-year NSF grant to examine "Nitrogen cycling under pressure: Measuring N-loss and N-recycling across redox gradients at deep-sea hydrothermal vents."



Ben Felzer received an Associate Professor Career Research Enhancement Award from the College of Arts and Sciences to support his work contributing to annual estimates of the global terrestrial carbon sink and the effect of land cover change on the global carbon budget.

Michelle Spicer was awarded NSF funding for a project that will use observational, experimental, and metagenomic approaches to describe and investigate vertical changes in the microbial diversity of forests.

"Subduction Top to Bottom 2," a special issue of the journal *Geosphere*, was the most-read themed issue in its twenty-year history. **Gray Bebout** served as chief editor.

JP Balmonte was awarded a Class of 1968 Research Award from the College.

Gray Bebout was awarded a Faculty Research Grant for a project entitled "Biogeochemistry of Altered Volcanic Glasses and the Search for Evidence of Life on Early Mars."

Dork Sahagian was awarded a Fulbright Scholarship to spend his sabbatical working and collaborating with scientists in Armenia. Dork also did an interview with WDIY in Fall 2025, speaking about climate change. Check it out!

Jill McDermott and **JP Balmonte** (and Santiago Herrera, Biological Sciences) were awarded a CAS Dean's Opportunity Grant to study the ecological impact of hydrothermal activity at Vailulu'u Seamount on overlying ocean productivity and deep-sea communities.

Anne Meltzer was reappointed as the Francis J. Trembley Chair in Earth and Environmental Sciences. Anne also received a faculty fellow grant from Lehigh's Center for Innovation in Teaching and Learning to integrate artificial intelligence into Exploring Earth (EES-022) labs.

Bob Booth was awarded a collaborative three-year NSF grant to continue his work developing the testate amoeba portion of the Neotoma Paleoecology Database (neotomadb.org).

Jordan Abell was awarded a Lehigh Faculty Innovation Grant for his proposal entitled "Constraining the modern spatial variability in extraterrestrial helium-3 to improve climate reconstructions."

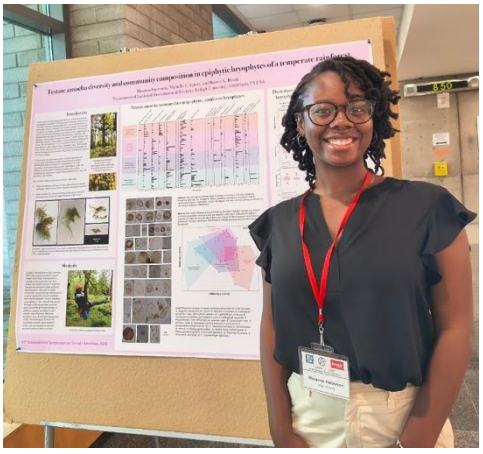
Celebrating Student Success!

Juan Felipe Bustos Moreno won the Dean's Graduate Student Research Prize for his graduate research on nitrogen cycling

Graduate student **N. Miller** won the PB Meyers Outstanding Teaching Assistant Award and a CAS Summer Fellowship.

Graduate student **Nora Vaughan** won a Dean's Fellowship for the Fall 2025 Semester.

Research Scientist **Laurel Humphreys** was awarded an NSF-GRFP to support her PhD research at UC Irvine investigating the effects of forest fires on soil microbes



Graduate student **Alexis Stansfield** won the best student poster presentation at the 2025 ISTA meeting (left with conference organizer Tim Patterson from Carleton University). Undergraduate **Rheanna Patterson** (right) also won third place for her poster presentation at the meeting.

Congratulations Dave!

Dave Anastasio Retirement Celebration

EES Professor Dave Anastasio retired after nearly 39 years of service to the university. The department hosted a retirement celebration for Dave, where former students expressed their congratulations and relayed numerous fun stories of their time working with Dave. Long-time collaborator Don Fisher (Geosciences, Penn State University) gave a talk in Dave's honor, and the department hosted a reception and a faculty and staff dinner. Dave is currently working on finishing up several projects, so we still get to see him around the STEPS building. Congratulations Dave!

Professor Dave Anastasio talking with Lehigh University president Joseph Helble '82

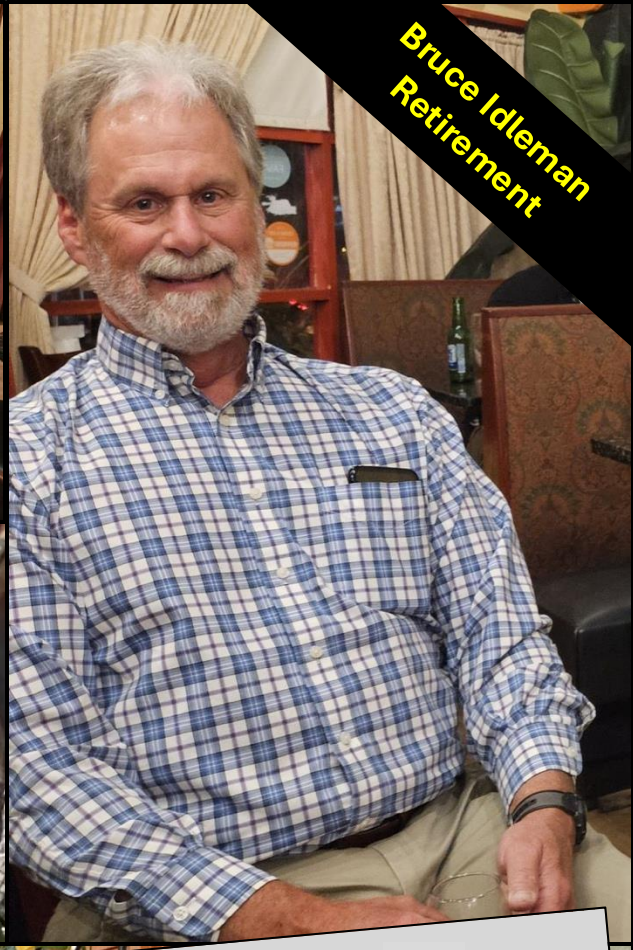

Dave Anastasio Retirement
Kristin Carter, PG, CPG
Assistant State Geologist, Geologic Re...
Congratulations on your retirement, Dave! Thank you for your many years of service to Lehigh's geology and earth science students....
Karl Wegmann
Professor of Geology at North Carolina...
Fantastic, Dave. Congrats on capping off a fantastic career of educating and research. We are all better scientists because of your teaching and mentorship. Karl
Amy Shotmeyer Porter
In-House Counsel at Christian Health
Congrats, Dave! Thx for being a great advisor, 20 yrs ago! Wishing you all the best on retirement!
Bob O'Neill
Chief Geologist at Brown and ...
Congratulations Dave. Many a young (and sometimes old) geologist has benefited from your mentoring and guidance! All the best. Bob
See more pictures and add your comments on LinkedIn!

Congratulations Bruce!

Bruce Idleman Retirement Celebration

EES Research Scientist Dr. Bruce Idleman retired after 30 years! Bruce's deep technical expertise has been a major contributor to the department's research and educational missions, and particularly the research laboratories of Gray Bebout, Ken Kodama, and Peter Zeitler. Bruce will be deeply missed, and we wish him the best in retirement.

Steve Peters and Linda Zaoudeh giving Bruce guides for his retirement sailing expeditions



Bruce Idleman Retirement

Christopher Osburn
Professor of Marine Biogeochemistry a...

Congratulations Bruce! Always thankful for your help building a home-made freeze dryer back in the day.

Alan Benimoff, PhD
Professor at College of Staten Island/C...

Congratulations Bruce

Josh Galster
Associate Professor at Montclair State ...

Congratulations Bruce!

See more pictures and add your comments on LinkedIn!

Welcome to the EES Community!

Jamerson Baynard joined the EES Department in July of 2024 as our Business Manager. He oversees departmental accounting and provides support for staff, faculty and students. Jamerson has over 20 years of experience in leadership and customer service, served 8 years in the United States Air Force, and prior to Lehigh worked as a department coordinator and service project manager. He holds an Associates Degree in Management from Lehigh Carbon Community College, a Bachelor's Degree in Business Management and Economics from Kutztown University and a Master's degree in Business Administration from Cedar Crest College. He enjoys traveling, music, outdoors activities, trying new restaurants, and spending time with his family and friends. Jamerson has also been an American Red Cross Volunteer for over 20 years.

Jessica Melhorn began in July of 2025 as our Laboratory Facilities Technician. Jessica earned a BS in Geology with a minor in Chemistry from Lafayette College. Her educational experiences involved a variety of fieldwork in the Lehigh Valley, Desert Southwest, Wyoming, and Bhutan. As a Gilman Scholar, Jessica travelled to Poland and Germany to investigate how past and present conflicts in Eastern Europe are impacting people today. Outside of work, she enjoys spending her time walking, sculpting, reading, visiting museums, and spending quality time with family and friends. Jessica is excited to be a part of the department, so please feel free to stop by if you're looking for any assistance or just want to chat!

Kelly McCartney is joining the department for the 2025-2026 academic year as a Visiting Assistant Professor. Kelly earned her Ph.D. in Earth Sciences from the University of Hawai'i at Mānoa in May 2024, with a focus on volcanology and igneous petrology. She has conducted research and fieldwork in Alaska, Hawai'i, the western United States and Canada, and the Canary Islands. Her work focuses on the physical and textural evolution of volcanic materials, with particular interest in explosive and effusive silicic eruptions. Kelly looks forward to fostering inclusive learning environments and engaging students in hands-on, inquiry-based Earth science education during the upcoming fall and spring semesters at Lehigh.

Katie Hemmerlin is joining us in the fall semester as an adjunct lecturer. She has a BS in Geology and a minor in Biology from Stockton University, an MS in Earth & Environmental Science from Lehigh University and will soon graduate with an MS in Mining Safety from Marshall University. She has extensive experience as a geologist, environmental scientist, educator, and regulatory health and safety specialist. Katie is passionate about translating complex geoscience concepts into impactful learning experiences. In her free time, she enjoys running, hiking, mineral collecting, playing the flute, reading, and working on the family farm.

22

ChangeMakers: The Power to Shape a Sustainable Future

Community engagement

EES brought together individuals and groups from Lehigh and the broader community interested in innovative approaches to ensuring a healthy and sustainable environment for all.

Ideas set in motion can change the world. From recognizing our deep connection with the Earth and environment, to innovations that make sustainability possible, to people who inspire new ways of thinking—change happens in unexpected, extraordinary, as well as subtle, quiet ways. But how do ideas lead to real change? Innovators in many fields show us how.

Our *ChangeMakers* event explored the work of individuals driving progress toward a sustainable future. Through the creation and sharing of ideas, the event highlighted people whose insights, strategies, and ambitions result in change, both small and large, moving us toward a sustainable future. The event brought together students, faculty, and staff from Lehigh as well as individuals and organizations from the broader community.

The event was kicked-off with a fascinating and inspiring presentation by a true *ChangeMaker* - Dan Kunkle, Director Emeritus of the Lehigh Gap Nature Center. Dan described the restoration efforts on the Kittatinny Ridge, which 25 years ago was devoid of vegetation because of pollution from zinc smelting in Palmerton. Dan had the vision and passion to lead a long-term effort to restore this Superfund site, and today the landscape is vegetated with an environmental education center.

Community engagement

SEEDS

Sustainability Education and Environmental Development

SEEDS is a new program EES developed in partnership with our neighboring Broughal Middle School to engage students with the Earth, environment, and sustainability. EES majors and minors work with Broughal Middle School students in activities designed to foster excitement and curiosity while supporting middle school science standards related to the environment and sustainability. SEEDS activities are also designed to help support Broughal's broader goals to improve student success in reading and math and help students explore a range of career paths, even at this early stage. EES students participating in the program gain experience with learner-centered inquiry-based approaches to education, community outreach, and service. **Anne Meltzer** has worked with a group of undergraduate students to pilot SEEDS over several semesters, and they plan to transition to formal club status at Broughal this fall. This past summer we also piloted a week long summer program that culminated in a day-long trip to Lehigh Gap Nature Center. SEEDS is part of EES Pathways, our department efforts to broaden participation in the Earth and Environmental Sciences.

Contributing to Bethlehem's Climate Action Plan (CAP)

As part of Bethlehem's Climate Action Plan (CAP), **Ben Felzer** has been a part of the Land Use and Green Space Committee, as a representative and Vice Chair of the Bethlehem Environmental Advisory Council. He regularly engages our students with these and other local environmental efforts, and this summer mentored undergraduate major **Will Lotto** to provide an estimate of the carbon stocks and fluxes of the South Mountain forest and Bethlehem's street and park trees. Ben is also working with Professor Breena Holland on a subset of the Lehigh Valley Breathes project to determine the relation of poor air quality in Bethlehem to meteorological and traffic patterns. During the 2024/2025 academic year Ben had five undergraduates working on the project.

Bubble Nucleation in Magmatic Systems

Bubble drive volcanic eruptions but the problem of initial bubble formation (nucleation) in magmas has confounded volcanologists for decades. To address this knowledge gap, a workshop was held at Lehigh to bring together researchers from all over the world who are interested in bubble nucleation and its role in determining the style of volcanic eruptions of all types. Participants came to learn from each other and from the organizers and ranged from elder luminaries to graduate and undergraduate students with a broad range of perspectives, priorities, and expertise, including theoretical, experimental and applied approaches. The venue in STEPS provided ample opportunities for short presentations, posters, and detailed discussions to compare different ways to address the problem. A "Field Trip" into the laboratory enabled participants to experience first-hand how bubbles can be generated in samples of volcanic glass, catching bubble nucleation in the act. The workshop focused on what we know, what we don't know, and what we need to know next, and thus laid the foundation for a new phase of research in volcanology.

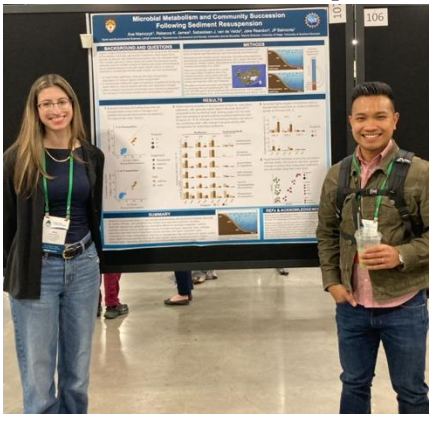
Organizing Committee:

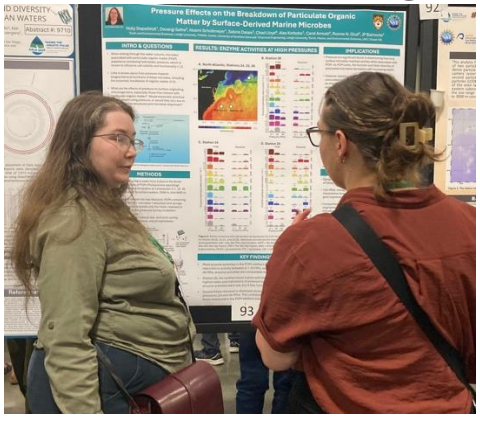
- **Dork Sahagian**, Lehigh University (Host)
- Jim Gardner, University of Texas
- Tamara Carley, Lafayette College
- Ed Llewellin, Durham University
- Halim Kusumaatmaja, University of Edinburgh
- Fabian Wadsworth, Ludwig-Maximilians-Universität, München

Special thanks to **Jillian Jacoby**, **Linda Zaoudeh**, and **Jamerson Baynard** for helping make the workshop successful!

EES Students and Faculty attended and presented research results at numerous scientific meetings in 2024-2025, including the annual meetings of the American Geophysical Society, the Geological Society of America, and many others….

ASLO 2025 Aquatic Sciences Meeting



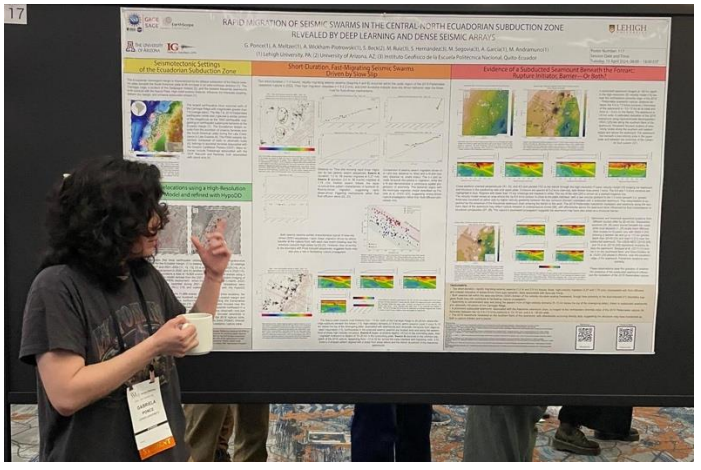


JP Balmonte's research group presented research results at the Association for the Sciences of Limnology and Oceanography (ASLO) Aquatic Sciences Conference in Charlotte, North Carolina. From left to right: EES Undergraduate **Ava Niemczyk** and **JP Balmonte** by her poster, graduate student **Holly Stapelfeldt** discussing their research, and **Noemi Schollmeyer** giving her research presentation.

EES in the World

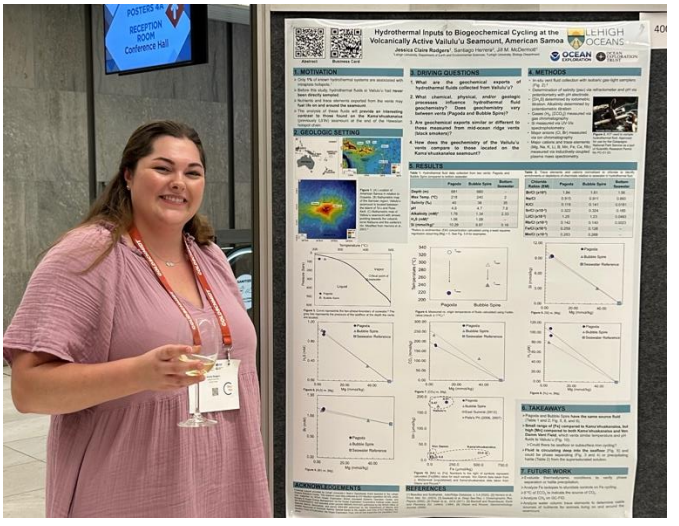
ISTA 2025 Conference

Bob Booth's research group presented research results at the International Society of Testate Amoeba Research (ISTA) meeting in Niagara Falls, Ontario. Pictured in the photo are **Bob Booth** (left), undergraduate **Rheanna Patterson** (middle), and graduate student **Alexis Stansfield** (right). Former MS student **Erica Cowper** could not attend but sent along a poster describing her research.



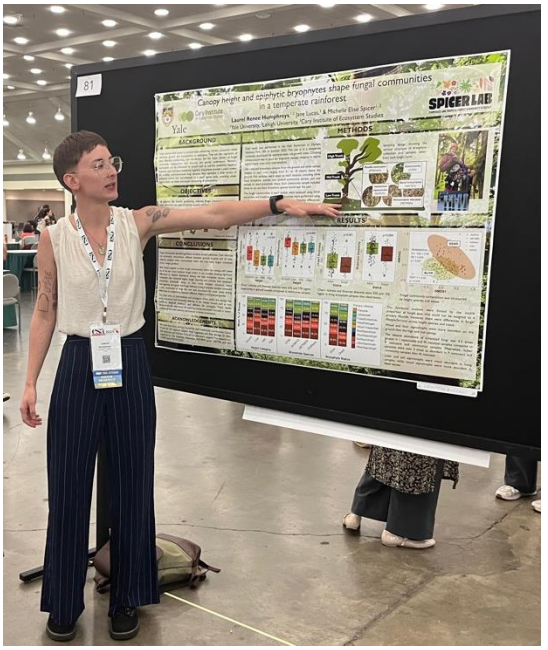
SSA 2025 Conference

Anne Meltzer's research group, including graduate students **Gaby Ponce** (above), **Artacely Garcia**, and **Michael Andramuno**, and post-doctoral scientist **Alex Wickham**, presented research at the 2025 Seismological Society of America (SSA) meeting in Baltimore, Maryland.



Goldschmidt 2025 Conference

Jess Rodgers, a PhD student in **Jill McDermott's** research group, presented her work at the Goldschmidt conference in Prague, Czech Republic. The annual conference is organized by the Geochemical Society and the European Association of Geochemistry.



ESA 2025 Conference

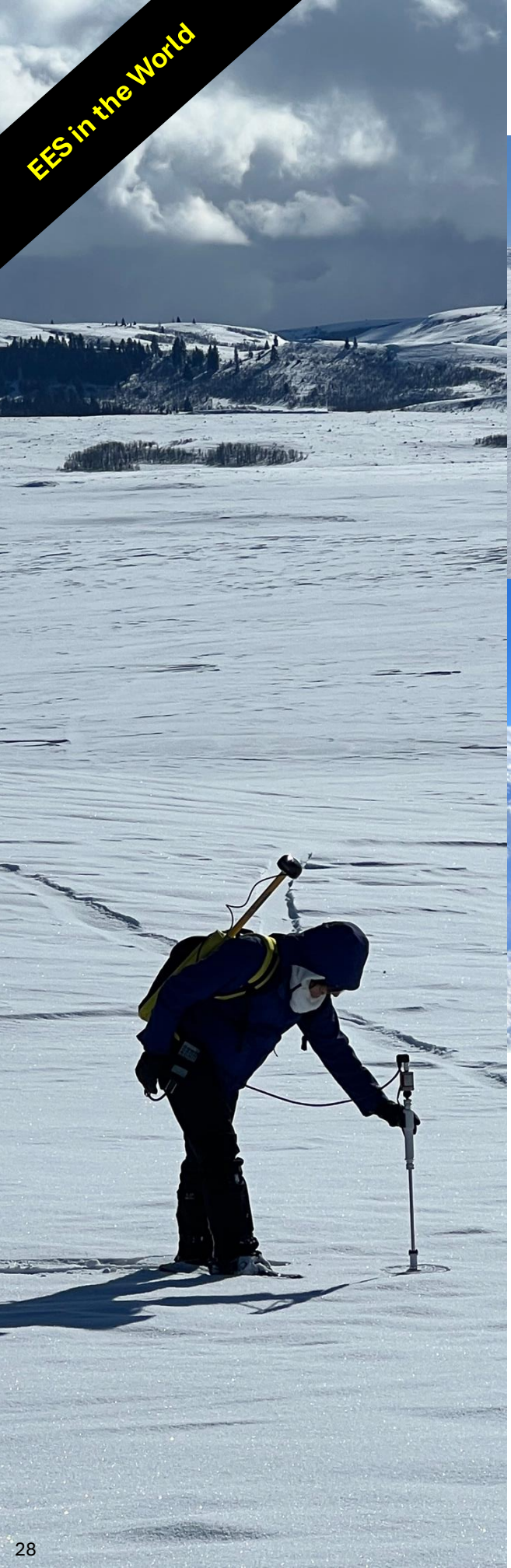
Michelle Spicer's research group, including **Laurel Humphreys** (above left and presenting poster on the right), **Matthew Gano** (above center), and **N. Miller** presented at the 2025 Ecological Society of America (ESA) Meeting in Baltimore, Maryland.

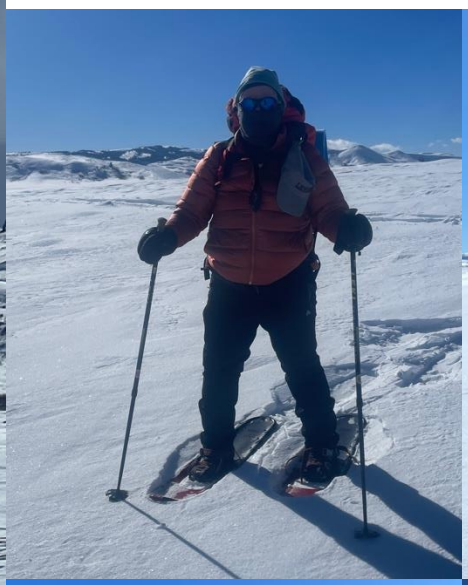
IAVCEI 2025 Meeting

Meredith Townsend's research group presented at the quadrennial IAVCEI conference (International Association of Volcanology and Chemistry of the Earth's Interior) in Geneva, Switzerland. From left to right: **Franziska Keller** (Lehigh postdoc), **Rebecca Bussard** (former PhD advisee of Meredith, now a postdoc at Penn State), **Gui Aksit** (PhD candidate at University of Oregon), **Meredith Townsend**, and **Kathryn Scholz** (PhD candidate at University of Oregon who recently successfully defended her dissertation!).

Check out this link for a CAS story on Meredith Townsend's research program

Fieldwork in Idaho…in February!





Joan Ramage's remote sensing lab group collected field snow observations in the Camas Prairie (near Fairfield, Idaho) as part of a collaboration with the Cold Regions Research and Engineering Lab and Boise State University. Photos show graduate students **Leia Barnes** and **Mahboubeh Boueshagh** with a Magnaprobe collecting GPS based snow depth measurements. Joan's daughter Aurora Macdonald also joined the team. They dug snow pits for detailed snow stratigraphy, water equivalent, and melt features. The team is developing and testing snow remote sensing techniques using drones, airborne lidar, plane and satellite-based radar and passive microwave observations. Joan and Aurora also made the journey to Idaho in an EV truck, an adventure during the winter due to the variable (and minimal) infrastructure for charging and extreme cold temperatures in the West and Midwest.

Expedition to the East Pacific Rise

Graduate students **Jada Siverand** (center, dark green shirt) and **Jessica Rodgers** (farthest left) prepare Alvin's sampling systems on deck aboard the R/V Atlantis before a deep-sea dive at the East Pacific Rise.

In spring 2025, **Jill McDermott's** research group led an expedition to the East Pacific Rise, one of the most volcanically active places on Earth. Graduate students played key roles by leading human-occupied Alvin submersible dives, assisting with autonomous vehicle Sentry mapping missions, and running winch operations for surveys to search for new hydrothermal vents. Working with Sentry, the team completed a map that covers more than 210 square kilometers of seafloor at one-meter resolution, including the first complete map of a volcanically active mid-ocean ridge where it meets a transform fault. They recovered long-term temperature loggers, collected high-temperature vent fluid samples, and documented vent sites in high detail. These efforts are building the baseline needed to understand how the deep seafloor changes before and after eruptions, with discoveries that will guide future missions. For our graduate students, it was a hands-on, career-shaping experience at the frontier of ocean science, advancing knowledge while training the next generation of deep-sea scientists.

(left) At the culmination of the AT50-33 expedition to the East Pacific Rise, Jill's team stands in front of the deep-submergence vehicle Alvin in its hangar aboard the R/V Atlantis. Left to right: PhD student **Esmira Bibaj**, **Jill McDermott**, PhD student **Jessica Rodgers**, PhD student **Jada Siverand** and Elizabeth Whitson, Pre-doctoral Research Associate in Biological Sciences.

Alumni supported experiences

Alumni donations in action!

Many of the activities highlighted throughout this newsletter were supported by alumni donations. For example, this year we were able to provide need-based financial support to all Lehigh students that attended field camp thanks to the **Vic Johnson Fund**, **the Imhof endowment**, and the **Palmer endowment**. We also used our endowed and gift accounts to fund numerous other research and experiential learning opportunities, and a few of the alumni-funded activities during the summer of 2025 are highlighted in the following pages.

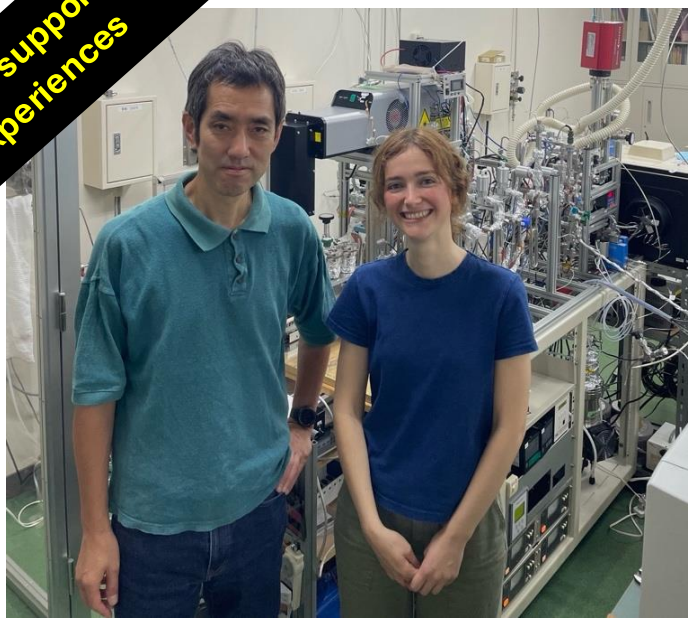
Pennsylvania is blessed with some of the finest State Parks in the country and spectacular waterfalls are among the attractions that make these parks so special. Ricketts Glen, Leonard Harrison, and Ohiopyle state parks, among others, host many waterfalls that have carved deep protective gorges with unique microclimates and a rich biodiversity unique to Pennsylvania. This summer, **Nyssa Notrica** (on right in photo) was supported by the **Palmer Fund** and undergraduate field assistant **Andreas Marangos** (left in photo) was supported by the **Ryan Fund**, on a project aimed at better understanding the formation of waterfalls in the Pennsylvania landscape, documenting the rate at which they are carving through the rocks, and assessing their connection, if any, to the unique flora that surrounds them. Nyssa's work this summer, under the mentorship of **Frank Pazzaglia**, involved collecting samples of alluvial sand upstream and downstream of the waterfalls that can be used to constrain basin-averaged erosion rates using cosmogenic ^{10}Be concentrations. Furthermore, she measured the rock mass strength of the various strata with a schmidt hammer upstream, within, and downstream of the waterfall reaches, and created maps of channel gradients using 3-D hand-held LiDAR photogrammetry. The goal is to incorporate these field data into a stream-power based numeric model that predicts when the waterfalls were born, and the rate at which they are subsequently incising the landscape.

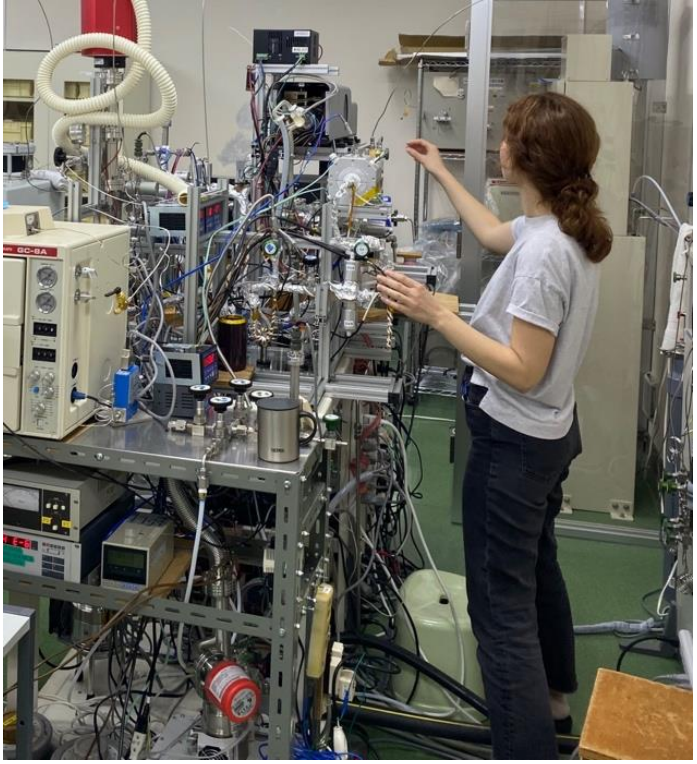
Alumni supported experiences

With the support of the recent **Scamman gift for experiential learning**, graduate student **N. Miller** spent the summer conducting experimental work in the local forest to investigate the mechanisms behind herbaceous biodiversity loss. Miller is examining how overabundant deer and non-native invasive plants impact native plant seed dispersal, seed banking, and survival. Miller led a field crew consisting of both undergraduates and graduate students, and they were out collecting data nearly every day, all summer!

Undergraduate student **Karen Defino** was supported by the **Bachert Fund** to work with the above team of students transplanting greenhouse-germinated native plants into the forest understory, testing how deer herbivory and invasive plant presence affect their survival. Karen's own project focused on how certain species adjust their physical defenses in response to browsing pressure from white-tailed deer, and she will be developing this into a senior honor's thesis under the mentorship of Michelle Spicer this year.

Alumni supported experiences





This summer, with the support of a **Taylor Fellowship**, graduate student **Esmira Bibaj** conducted research at the Institute for Planetary Materials, Okayama University in Misasa, Japan. Working in collaboration with Dr. Ryoji Tanaka (pictured), she spent June measuring triple oxygen isotopes in hydrothermal vent fluids collected across the Pacific Ocean. Her research focuses on deep-sea hydrothermal geochemistry along mid-ocean ridges and hotspot-influenced regions, where seawater penetrates deep into the seafloor, reacts with hot rock, and re-emerges enriched in dissolved metals and gases. By analyzing the chemical and isotopic composition of these fluids, Esmira seeks to trace their subsurface pathways and understand the role of hydrothermal circulation in global geochemical cycles. This work uses samples collected by **Jill McDermott's** research group in the Galápagos, the East Pacific Rise, and the American Samoa intraplate volcano, and her results will be presented at the 2025 AGU Fall Meeting in New Orleans.

Supported by the **Bachert Fund**, undergraduate **Hannah Hagley** (center in the photograph) spent the summer at the University of Copenhagen working with Professor Kathrin Rousk on the impact of drought on moss-cyanobacteria nitrogen fixation and photosynthesis. She conducted five experiments exposing two temperate and two mediterranean moss species to a series of drying and rewetting conditions to characterize the recovery of biological processes such as nitrogen fixation and photosynthesis. Samples were then sent to Lehigh and Hannah worked with **JP Balmonte** to extract the 16s gene from the samples for sequencing. The purpose of the DNA sequencing was to determine the cyanobacteria community assemblage to contextualize the results. Hannah plans to develop this project into a senior honors thesis this year.

This summer, graduate student **Juan Felipe Bustos Moreno** was supported by a **Taylor Fellowship** to conduct research at the Institute for Planetary Materials, Okayama University in Misasa, Japan. In the photo above, Juan and colleagues are working with the SIMS 1280 instrument, measuring nitrogen and carbon abundances in Icelandic basalts. Juan is working with **Gray Bebout** and additional funding for his work comes from the Institute for Planetary Materials. The work aims to identify biosignatures in terrestrial analog samples of Mars.

After assisting at field camp, graduate student **Matthew Gano** was supported for the rest of the summer by a **Kravis Fellowship** to complete computational work for his tropical forest canopy microbial community assembly project. He used the R coding language to analyze bacterial and fungal community data from wood blocks in the canopy and on the ground in Panama. Matthew was able to determine that the mechanisms behind microbial community assembly of deadwood are distinct on the ground and in the canopy, with establishment limitation driving community assembly in the canopy and competition driving community assembly on the ground. In August, he presented this research at the Ecological Society of America Conference in Baltimore, Maryland. Following the conference, Matthew and Ph.D. adviser **Michelle Spicer** visited Santa Fe National Park, Panama, where he worked in the forest canopy to test new data collection methods in preparation for this winter's field season.

Alumni supported experiences

With support from the **Palmer endowment**, graduate student **Nora Vaughan** is studying how tectonic uplift has shaped the Mongolian Altai mountains by examining a series of ancient river terraces and soils. Using the first detailed soil characterizations in this region, combined with numeric age dating, she is measuring how quickly rivers have carved into the landscape and comparing those rates to models of mountain growth. The work will deepen our understanding of how tectonics and climate interact, contribute to a larger NSF-funded project of **Frank Pazzaglia**, and help to assess modern seismic hazards in a region that has produced some of the world's largest earthquakes.

Graduate student **Becca Mitchell** was funded by the **Williams-Upton endowment** and the **Scamman gift for experiential learning**, to conduct fieldwork in Hawai'i this summer, examining lava flows and gathering ultramafic xenoliths that were brought to the surface by the 1800 eruption of Hualalai. She studied the mineralogical and morphological characteristics of her samples to assess the physical and chemical relationships between xenoliths and their host magma before and during eruption. Becca's research will shed light on unobserved processes of magma transport in post-shield stage Hawaiian volcanism.

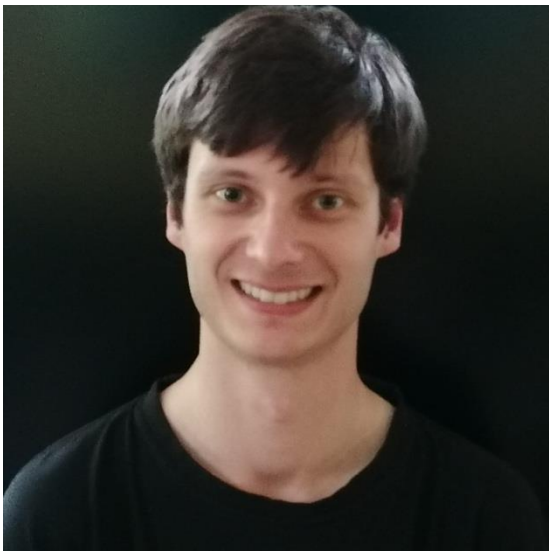
Supported by a **Kravis Fellowship** and the **Farny Fund**, graduate student **Leia Barnes** was able to spend the summer building landscape evolution-based models (LEM), using a Python-based package called Landlab. She attended the 2025 Earth Surface Processes Institute (ESPIn) training program held at the Community Surface Dynamics Modeling System headquarters at the University of Colorado, Boulder, where she gained the expertise to simulate synthetic landscapes and run landscape evolution-based events, modelling a watershed similar to Upper Saucon Creek, which is her field site. In the above photo of students in the course, Leia is second from the left in the front row. Leia's research work with **Joan Ramage** and **Frank Pazzaglia** is focused on isolating the different variables that contribute to increased flooding to help inform policy and it integrates modeling, GIS, and field work.

Undergraduate **Will Lotto** was supported by the **Ryan Fund** to examine the carbon flux of the forest ecosystem on South Mountain as well as the biomass of Bethlehem street trees. Results show that the forest is currently losing carbon and is a net carbon source to the atmosphere, and Will's work with **Ben Felzer** this summer established a baseline for Bethlehem trees to assess future changes in biomass.

Post-doctoral Scientists in EES

Franziska Keller is a post-doctoral scientist working with Meredith Townsend's research group. She earned her doctorate from ETH Zürich, and her research explores the Earth's interior processes that drive hazardous volcanic eruptions by combining insights from volcanology, magmatic petrology, and geodynamics. She studies phenomena from the crystal to lithospheric scale, linking magma storage and evolution to the architecture of crustal plumbing systems. By integrating petrological observations with computer simulations, Franziska aims to better understand how long-lived magmatic systems form, evolve, and ultimately erupt.

Alexander Wickham is a post-doctoral seismologist who studies subduction zones, particularly the Ecuadorian subduction zone. He is working on building and improving the resolution of seismicity catalogs to get a finer image of active fault structures. He is interested in investigating the physical modes of control of earthquakes, especially large megathrust earthquakes. This implies performing tomography inversions, which solve for both earthquake hypocentral solutions and velocity structure. Contrasts and gradients in velocity or other physical properties of in situ material help identify rheological boundaries and structures that may either promote or impede rupture processes. Moreover, Alex is deeply interested in studying the spatial-temporal variations of earthquakes in the context of swarm-like seismicity that can be associated with a type of aseismic slip process known as a Slow Slip Event. Hence, the migration pattern of seismicity provides valuable insight into its driving mechanism.



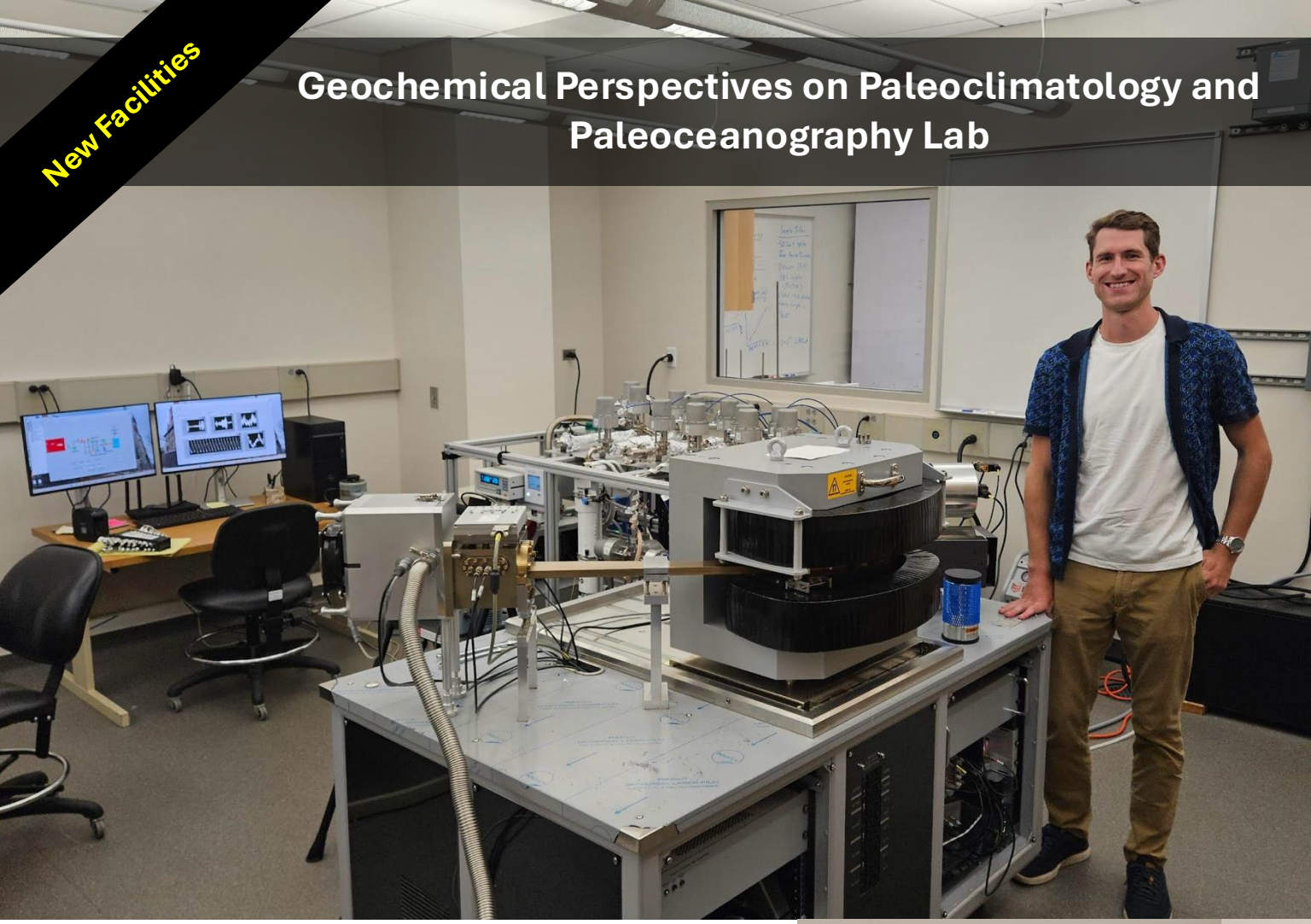
New Facilities

A new research greenhouse on South Mountain!

Michelle Spicer's new research greenhouse opened in January 2025 to support tropical and temperate plant ecology research. Located on the Mountaintop Campus, the 24x36' facility has automated temperature, humidity, and light levels to provide a well-controlled environment for plants. In the tropical-climate half of the greenhouse, Michelle's research group is experimentally testing the effects of soil microbial communities on tropical aroids (family Araceae). It also contains a growing long-term study collection of tropical orchids. In the temperate-climate half of the greenhouse, germination and seed bank studies are being run with native forest herbs, to better understand factors controlling understory forest diversity. Graduate students, undergraduate students, and technicians are all engaged in hands-on research in the greenhouse.

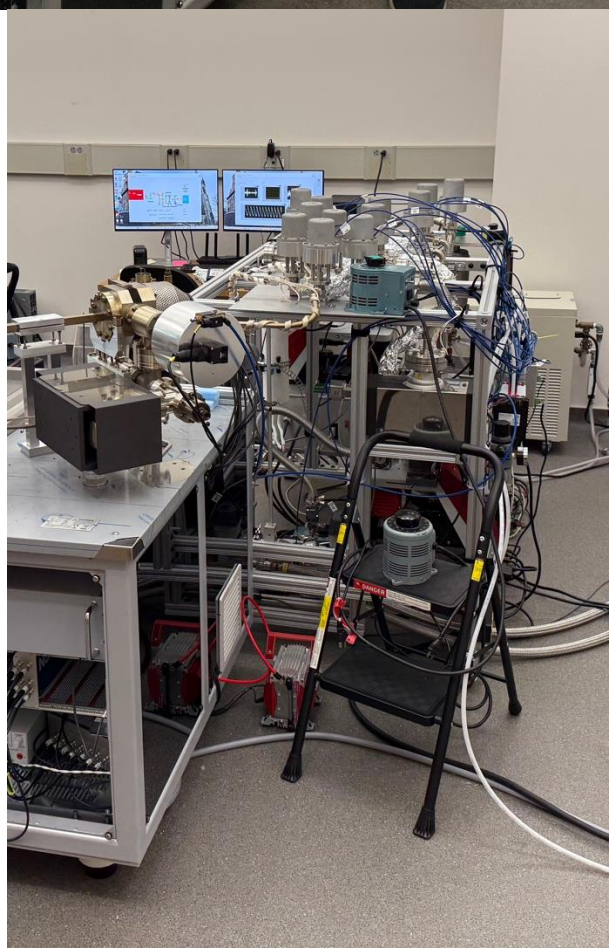
New Facilities

Geochemical Perspectives on Paleoclimatology and Paleoceanography Lab



Jordan Abell's Geochemical Perspectives on Paleoclimatology and Paleoceanography (GP3) Lab combines noble gas mass spectrometry with major, trace, and rare-earth element geochemistry to reconstruct the evolution of the Earth System through time. For the noble gas component, the lab specializes in the measurement and application of helium isotopes to accurately quantify the accumulation rate of material on the ocean floor. Other potential noble gas-related research areas include cosmogenic nuclide dating/erosion rates and characterizing the accretion of extraterrestrial material to Earth. For their elemental geochemistry work, the group predominantly focuses on inorganic proxies for detrital and biogenic material in marine sediments. By combining these data with sediment accumulation rates determined using helium isotopes, they can evaluate how atmospheric circulation, ocean circulation, and ocean productivity changed across a variety of timescales. Additionally, the group applies sediment elemental geochemistry to archaeological questions to learn more about past human interactions with the environment.

Jordan spent the summer getting his new lab up and running!



Congratulations to our graduate class!

Graduate Theses
2024-2025

Michael Andramuno. MS Thesis. Landscape response to active deformation in the Ecuadorian Forearc, (Advisor: Anne Meltzer)

Sedona Boyle. MS Thesis. Characterization of the Boulder Front Fault and Uplift Rates in the Northern Basin and Range Province, Idaho. (Advisor: Dave Anastasio)

Erica Cowper. M.S. Thesis. Using herbarium moss specimens to investigate testate amoeba ecology and responses to environmental changes in the New Jersey Pine Barrens. (Advisor: Bob Booth)

Vanessa Dadeboe. MS Thesis. Exploring the Role of Facilitation and Functional Traits in Secondary Successional Processes of Arboreal Plants in a Temperate Rainforest. (Advisor: Michelle Spicer)

Aracely Garcia. MS Thesis. The Atacames Seismic Swarm: Insights into Earthquake Migration and Fault Activation. (Advisor: Anne Meltzer)

Giana Greger. M.S. Thesis. Apatite geochemistry of the Askja 1875 caldera-forming eruption. (Advisor: Dork Sahagian)

Ashley Pastore. M.S. Thesis. The Jersey shore is haunted by ghost forests: Vegetation and soils record altered forest functionality in the wake of sea level rise and storm inundation. (Advisor: Dork Sahagian)

Jonathan Wallace. MS Thesis. Quantifying the Pleistocene Incision and Integration History of the Middle Allegheny River, a Glacial Margin Continental Drainage, in Northwestern Pennsylvania, USA. (Advisor: Frank Pazzaglia)

Looking forward to the 2025-2026 academic year!

Budding volcanology group at Lehigh -- from left to right/back to front**: Kelly McCartney**, **Franzi Keller**, **Meredith Townsend**, **Andreas Marangos** (4th year undergrad thesis student), **Dork Sahagian**, **Becca Mitchell** (MS student), **Beck Knittel** (MS student), and **Emily Walsh** (4th year undergrad thesis student)

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Want to join in the fun?

The faculty and staff would like to extend an invitation to alumni to stay in contact with EES and to get involved with the Department. Contact us and let us know how you would like to be involved.

Many of the programs we offer in EES that allow us to excel in education and research are made possible by endowed accounts and annual donations by alumni. We are always looking to augment our resource base for graduate and undergraduate research, EES field programs, and Departmental laboratory and educational facilities. We thank you, in advance, for your consideration and support. If you are in a position to donate, please choose your method below:

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