

# EES Newsletter 2021



Greetings from all of us here in EES – we hope you’ve had a safe and productive (and at times, even enjoyable) 2021 despite the complications related to the COVID virus. EES has continued to adapt to this changing virus-impacted landscape, rather gracefully I think thanks to the extraordinary efforts of our faculty, staff, and graduate students. You’ll be impressed by the achievements outlined in this year’s newsletter!

We began the year again hopeful that we’d see some return to “normal” conditions but, of course, that plan was quickly quelled by the virus surge over the winter months. The Spring semester was conducted nearly entirely in virtual learning mode, with only a few in-person labs and lectures. This again meant very few field trips taken, another delay of the Donnel Foster Hewett Symposium, and departmental seminars largely online. The EES Graduate Symposium became the EES Graduate Zoom-posium, experienced in a virtual conference center (weird, but fun). The Undergraduate Symposium was again conducted online, as we said goodbye to another group of talented EES majors experiencing their final semesters largely peering into computer screens.

In May, Lehigh ran separate Commencement exercises for the 2020 and 2021 undergraduate classes and a 2020-2021 combined exercise for those graduating with M.S. or Ph.D. degrees. These were well-attended by the EES graduates and, although complicated by masking and distancing, they were fantastic celebrations of what our students achieved and a chance to hear about their career and life plans.

Summer brought the Delta variant surge but first gave us a chance to catch our breath and.....prepare for an uncertain Fall semester. In the Fall, all were required to be vaccinated and, after a surge in student virus cases in late August/early September, we were able to have some semblance of a “normal” semester, with classes largely in-person.

EES has shown incredible energy and resiliency, making the most of a challenging time and maintaining most of its identity and personality. The support of our alumni and donors helps keep us moving forward, allowing us to pursue meaningful research and engage students in our intellectual adventure. Thank you all - we wish everyone a safe, productive, and enjoyable 2022.

A handwritten signature in black ink, appearing to read "Gray E. Bebout".

Gray E. Bebout, Professor and Department Chair  
Department of Earth and Environmental Sciences



# Congratulations to the Class of 2021

## Undergraduate Students - Spring, 2021

Patrick Clark - BA-EES | Kevin Gersbeck - BA-EES | Matthew Ilchuk - BA | Jason Katz - BA-EES

Adam Patching - BA-EES | Ada Patterson - BA-EES | Matthew Rothman - BA-EES

Alexander Skrapits - BA-EES

Julia Bebout - BS-EES | Katherine Benware - BS-EES | Vicki Jagdeo - BS-EES | Julia Keiser - BS-EES

Jon Krupnick - BS-EES | Alexandra MacVicar - BS-EES | Rebekah Nicholas - BS-EES

Marley O'Neil - BS-EES | Katherine Volpe - BS-EES

## Graduate Students - Fall, 2020, and Spring, 2021

Gabe Epstein - PhD | Benjamin Bliss - MS | James Fisher -MS | Ethan Kurak - MS

Will Reichard-Flynn - MS | Alexandria Sabo - MS | Frank Tetto -MS

## Graduate Students - Summer, 2021

Tiffany Baumann - MS

## Graduate Students - Fall, 2021

Heidi Cunnick - PhD | Matthew Nikitzuk - PhD

## Field Camp Update

Following two years of suspended operations, the EES Field Camp is being run this year and has a nearly full roster of students and faculty ready to embark on a new voyage of discovery. The group will depart the Bethlehem PA campus in late May, and return in early July, traveling through most of the northern tier of the United States learning about the Earth and Environmental Sciences. Specific projects target skills development in geologic interpretation of outcrops, understanding map patterns, and interpreting complex geologic structures. Students form connections between the observed modern ecology and surface processes and the preserved records from the geologic past. The group will travel through and camp in the ecoregions from the northern and temperate forests, the great plains, the North American deserts, and the northwestern forested mountains. In addition to building technical skills, students acquire the touchstone experiences of knowing the color of the Chugwater Formation, the sounds and smells of the tall- and short-grass prairie, the relationship between climate and elevation, the fossils of the Sundance Formation, and the overall broadened perspective that comes with the group experience. Rich field programs help students connect concepts learned in other coursework and enhance the skills needed to work effectively in diverse teams. The central goal of the program is to build the confidence and field experience needed to succeed as a professional Earth and Environmental Scientist. We look forward to this renaissance year and the learning experiences every day in camp.



## PhD Dissertations and MS Theses

### Winter 2020/2021

**Gabe Epstein PhD**, Advisor Gray Bebout

"Major and trace element, stable isotope, and noble gas constraints on volatile cycling in active and fossil subduction zones"

### May 2021

**Benjamin Bliss MS**, Advisors Frank Pazzaglia & Ken Kodama

"Examination of High Frequency Exogenic Forcing in Deltas"

**James Fisher MS**, Advisors Dave Anastasio & Frank Pazzaglia

"Numerical modeling of river longitudinal profiles with variable erosion: a comparison of baselevel fall at the northern Apennine mountain front"

**Ethan Kurak MS**, Advisor Frank Pazzaglia

"Terrace and Long Profile Evolution of the Youghiogheny River, Ohio State Park, Pennsylvania"

**Will Reichard-Flynn MS**, Advisor Anne Meltzer

"Performance Evaluation of Machine Learning Phase Detection Models on a Megathrust After-shock Sequence"

**Alexandrea Sabo MS**, Advisors Bob Booth & Steve Peters

"Physiology or Environment? What controls testate amoebae shell geochemistry? "

**Frank Tetto MS**, Advisor Ken Kodama

"Paleomagnetism of the Glen Mountains Layered Complex."

### Summer 2021

**Tiffany Baumann MS**, Advisor Gray Bebout

"Abundance, Textures, and C-O Isotope Compositions of Carbonate in HP/UHP Meta-Ophiolitic Breccias: Implications for Deep-Earth Carbon Cycling"

## Awards

### Undergraduate Awards

**Julia Bebout** - Donnel Foster Hewett | **Vicki Jagdeo** - Munford | **Emily DeAlto** - Handwerk

### Graduate Awards

**Matthew Nikitzuk** - P. B. Myers Best Teaching Assistant Award

### Graduate Symposium Awards

**Hongcheng Guo** - Best Talk | **Mariah Matias** - Best Poster

## Welcome New Graduate Students

### PhD Students Fall 2021

**Barnabas Adeyemi** Advisor: Anne Meltzer | **Mahboubah Boueshag** Advisor: Joan Ramage

**Juan Felipe Bustos Moreno** Advisor: Gray Bebout | **Biren GC** Advisor: Anne Meltzer

**Jada Siverand** Advisor: Jill McDermott

### MS Students Fall 2021

**Vicki Jagdeo** Advisor: Joan Ramage | **Jared Koderer** Advisor: Ben Felzer

**Scott Moyer** Advisor: Dork Sahagian



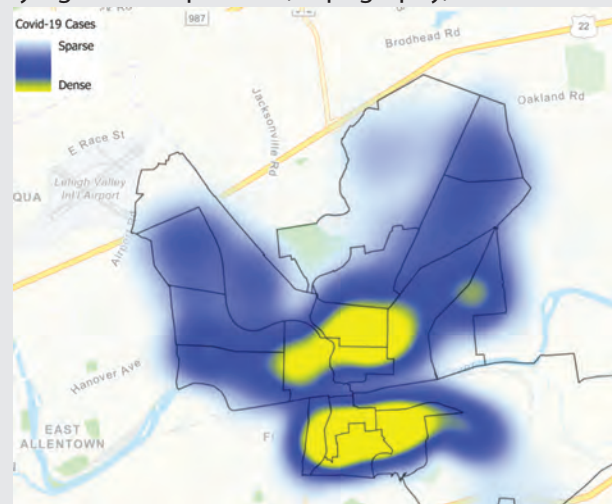
## Department Happenings

### Building a Lehigh Environment and Health Inequities Research Community to Study Covid-19 and Exacerbated Impacts of Air Pollution and Social Inequities on Public Health

An interdisciplinary team from all five Lehigh Colleges is organizing a new research thrust to explore linkages between environmental conditions, race, social inequities and human health. Long-standing income and wealth disparities among ethnic groups and socioeconomic classes have come to the fore with the advent of COVID-19. The pandemic has highlighted that historically marginalized populations in many urban settings (including the Lehigh Valley) are disproportionately impacted by COVID exposure, morbidity and mortality. As such, we are initiating research on this broad topic by focusing specifically on how social variables such as ethnic origin and socioeconomic class interact with environmental factors such as air quality to shape health outcomes. **The effort is being organized by Professor Dork Sahagian (EES and Environmental Initiative), along with other EES faculty Ben Felzer and Joan Ramage.**

As a former Rust Belt community, the Lehigh Valley (LV) provides an ideal case study for this endeavor. It is large and densely populated enough to illustrate many of the environmental problems and social impacts associated with industrialization. For instance, as the fourth most air polluted area in PA, the LV is characterized by a historical legacy of industrial activity and attendant pollution, a broad range of social and economic disparities, and an ongoing set of new environmental challenges, such as poor air quality and land use impacts caused by the recent growth in the trucking and warehousing industries. While current air pollution may be partly caused by local sources of emissions such as bus and truck exhaust, factories, etc., it is also affected by varying weather patterns, topography, and other factors related to climate change.

**IMAGE:** COVID incidence, hospitalization and mortality are greater in Latino and African-American communities within the Lehigh Valley. Brighter yellow indicates higher incidence. This project seeks to determine what environmental factors may contribute to this inequity in vulnerability to COVID-19 and future pandemics.



The group plans to initially focus on the relationship between COVID morbidity/mortality (for which data are readily available) and air quality, which is commonly degraded in urban areas, and exacerbated by changing climatic conditions. While air quality is currently easier to measure than other environmental media to which people in urban environments are also disproportionately exposed, it is likely that there exist multiple other stressors such as poor water quality, nutrition, and access to preventive medical care that impact the health of the urban poor, and that these may be further exacerbated by degraded air quality and heat stress due to climate change. Thus, the initial point of departure is also a point of entry into a broader set of social and environmental variables and evolving relationships, and it is hoped that Lehigh can be established as a leader in this emerging research area. To launch the effort, the group was awarded a "Futures Ideation Grant" from the Lehigh Office of Research. The grant will support organizing and initiating substantive conversations among faculty, community members and organizations, schools, and governmental institutions about problems and questions that collaborative research can productively address. A series of workshops will be organized during the coming Fall Term and beyond to broaden participation throughout the University and the Lehigh Valley community. These will focus on establishing ongoing research projects involving 1) environmental conditions impacting health inequities, 2) the social and political structures that lead to these conditions, 3) the educational and opportunity gaps that keep the urban poor in low-wage service industries more vulnerable to pandemics, and potential policy mechanisms to address each of these barriers. Lehigh will thus be the "go to" center for community leaders and policy-makers throughout the Lehigh Valley, setting an example for other urban areas nationally. Open invitation to LU faculty for the initial workshop will be forthcoming.

## Department Happenings

In the Fall semester, the class Seismology: Earth and the Environment, partnered with Historic Bethlehem Historic Museums & Sites, to use ground penetrating radar (GPR) to discover part of colonial history in Bethlehem. The class, taught by Adjunct Professor and Lehigh alum Mariah Hoskins, used GPR to find the foundation of the 1700s-era tawry building--an important manufacturing building where soft leather was made. GPR works similarly to a CT scan, and is a non-disruptive method of mapping the electrical properties beneath the surface. Because stone foundations have different electrical properties than the surrounding soil, GPR is used extensively in such archeological applications, and proved to be effective in this survey. With the help of partners at Historic Bethlehem Museums & Sites, the class identified the field where the tawry was most likely located, based on plat maps. The class conducted the GPR survey which involved dragging the box containing the GPR unit back and forth across the field. Each line across the field produced essentially a cross section showing the electrical properties beneath the surface. In the lab, students used software to combine the cross sections into a 3D volume showing the electrical properties beneath the field. From this 3D volume, the students identified a linear disturbance that they deduced to be part of the foundation of the tawry. Being able to map where part of the foundation of the tawry building was is a great contribution to learning more about the Colonial industrial era of Bethlehem.



EES 201 Seismology, Fall 2021

## McDermott Group

Recent research highlights in the McDermott lab focus on deep sea hydrothermal geochemistry. Ph.D. student William 'Billy' Dowd, M.S. student Connor Downing, and Postdoctoral Researcher Kelden Pehr sailed on an expedition aboard RV Revelle to the 9°50'N segment of the E. Pacific Rise on Assistant Professor Jill McDermott's NSF funded research expedition in March and April, 2021. The first of three cruises, the McDermott group seeks to determine links between fluid chemistry and the permeability of the seafloor during the years building up to a deep sea volcanic eruption. While at sea, Kelden, Billy, and Connor used the remotely operated vehicle Jason II to collect hydrothermal vent fluids and associated mineral deposits. After a productive expedition, the group is now working on sample analysis and interpretation. Part of these efforts focuses on the quantification of organic species in hydrothermal deposits exposed to varying high temperatures, the focus of Kelden Pehr's NASA Astrobiology funded postdoctoral work. Billy is investigating the abundance and origin process of intermediate redox S species in the fluids, while Connor is collecting geochemical data that will constrain the conditions of fluid origin and relationship with permeability changes.

In the fall, 2021, the group returned to the Soudan Underground Mine State Park, in N. Minnesota. This is the site of a second multi-year NSF-funded study by the McDermott group that is investigating the feedbacks – both positive and negative - between isolated microbial life and the Neoproterozoic banded iron formation deposits that provide habitat and energy. They collected additional water and gas samples from the site for sulfur species geochemical analysis and isotope determination.

The NOAA-funded environmental DNA project also was wrapping up in the Fall, 2021. In a collaboration between the McDermott group and Assistant Professor Santiago Herrera's lab, the group has determined the environmental controls on the rate of environmental DNA degradation in laboratory experiments that mimic the natural variability of conditions in the mesophotic 'twilight' zone of the ocean.

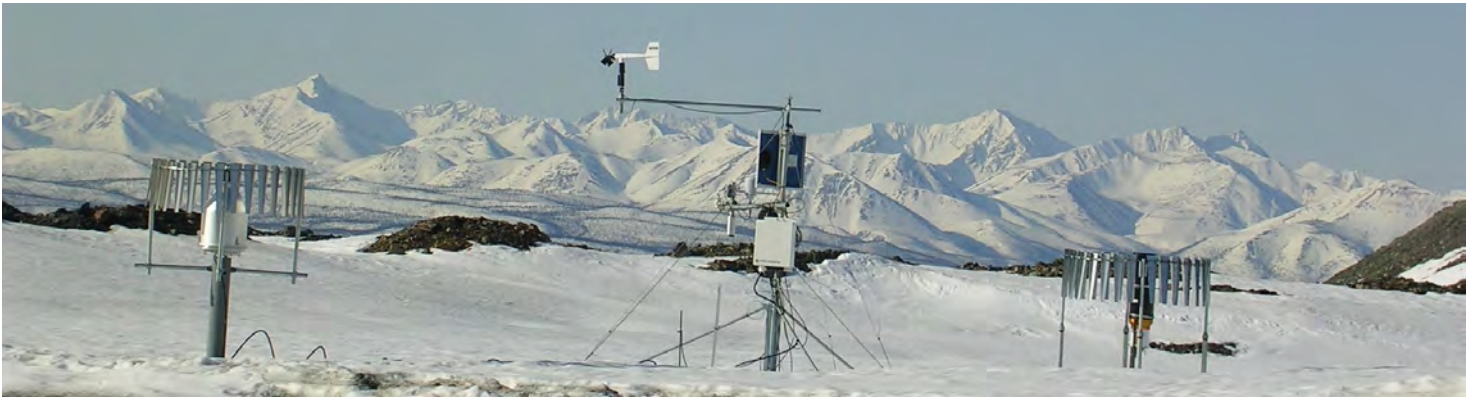
Finally, the McDermott group extended a warm welcome to new Ph.D. student Jada Siverand!

**VAN LIFE:** EES M.S. student Connor Downing on watch during remotely operated vehicle Jason II submersible operations. The video feed from the remotely operated vehicle streams into the ship in real time, as seen on the screens. The pilots are collecting a hydrothermal fluid sample, while Connor records observations. Credit: Nicole Pittors





## Ramage Group



**Joan Ramage**, with Mary Jo Brodzik at the University of Colorado, recently received a large grant from the Army's Cold Regions Research and Engineering Lab (CRREL) to study Snow Melt Detection Using Calibrated Enhanced-resolution Brightness Temperatures (CETB) & Pixel-level Statistics: Implications for Snow Water Equivalent Estimation, Run-off Timing, & Mobility. Snow melt is an important characteristic of snow packs in snow dominated landscapes and downstream drainage basins. Melt changes the characteristics of the snowpack, enhancing grain metamorphism and, along with refreezing, generating or enhancing ice layers in the snowpack. Changes in snow strength and structure impact vehicle mobility, and changes in liquid water content decrease the albedo, impacting energy balance. The timing, intensity and duration of snow melt directly affect runoff timing and magnitude, often with accumulated impacts such as flooding on communities and infrastructure downstream. Compared to dry snow conditions, timing and extent of melting snow significantly changes planning of vehicle or troop movement. Snow water equivalent (SWE), the mass of snow on the landscape, is key for determining total runoff peaks and volume. Efforts to measure SWE using passive microwave (PM) methods are confounded by the increase in microwave brightness temperatures upon melt, and by the challenge of distinguishing melting snow from snow-free surfaces. Their work leverages state-of-the-art enhanced-resolution passive microwave products to observe and map melt onset and duration, and improve uncertainty estimates in related SWE estimates. The three year project will support graduate students at Lehigh, and will benefit the public interest by providing novel melt onset maps, for use by data analysts and water managers to improve runoff predictions and mobility limitations.

## Highlighted Undergraduate Research

**Julia Bebout:** This project, working with **Bob Booth**, identified the environmental controls on community composition of testate amoeba species in understudied wetland types in the White Mountains, NH. Most studies reconstructing past environment based on the ecology of fossil amoebae have only considered bog communities. Wetlands like swamps and marshes may present an opportunity to broaden the global distribution of such studies. This work improved our understanding of the environmental controls shaping these understudied protist communities, making us better poised to use fossil amoebae from a range of wetland types for paleoenvironmental studies.



**Brianna Gipson** conducted research with **Joan Ramage** monitoring changes in air quality during COVID-19 lockdown. Brianna used satellite data to observe atmospheric  $\text{NO}_2$  data from the AURA-OMI instrument and compared it with hospitalizations, weather, and traffic. She documented significant relationships between air quality and COVID outcomes, especially early in the pandemic. Brianna graduated with a major in Biology and a minor in EES and is now working in the medical field.

**Image on right:** Brianna Gipson at 2018 Eastern Snow Conference field trip (Annapolis, MD). Photo by J. Ramage



During the 2020-2021 AY, **Vicki Jagdeo** conducted undergraduate research with Professor **Joan Ramage** on Iceland's Vatnajökull glacier. Vicki used synthetic aperture radar (SAR) to identify radar glacier zones of wet and dry snow, ice, and melt surfaces. They used both active and passive microwave satellite data to detect these zones and seasonal changes on the surface as well as to analyze differences in melt and refreeze signatures between them.

**Image on right:** Processing and analyzing satellite imagery in the STEPS Lab on the European Space Agency (ESA) Sentinel Applications Platform (SNAP).



## Highlighted Undergraduate Research



**Jon Krupnick** (lower student, **photo on left**), working with Professor **Frank Pazzaglia**, completed a senior thesis entitled "Grain size control on rock magnetic cyclostratigraphy withing glacial delta sediments, Sciota, PA". Jon's research focused on the question of what minerals and what grain sizes carry the magnetic signal that is encoded in stratigraphic sections that are the basis of the time series used in the construction of cyclostratigraphic age models. Jon participated in the measuring of 24 m of section at the Sciota kame delta located ~40 km north of Lehigh on the Wisconsinan glacial margin, and collected grain size samples at 20 cm intervals. Time series analysis of the grain size data indicates that the magnetic signal is modulated primarily by the silt and clay size fractions, which likely serve to dilute an otherwise relatively uniform concentration of magnetic minerals. Upon graduation, Jon found employment with the Wyoming Geologic Survey as a field mapper where he has worked on assembling the data for several quadrangles.



## Welcome Linda Zaoudeh!

On January 3, 2022, we welcomed Linda Zaoudeh as our new EES Technical Assistant. Linda has a BS in Environmental Science and a minor in Geology from Temple University. She has had a vast amount of experience in and outside of the environmental sciences field. In her free time she likes taking nature walks, gardening and spending time with family. She also enjoys exploring museums, watching live theater, listening to music and being creative in various art media.

If you are in STEPS please feel free to stop by her office in ST 124 and say hi.



## Thanks to Our Adjunct Instructors

### A shout-out to our recent Adjunct Professors!

We'd like to acknowledge and thank the Adjunct Professors who have assisted us in managing high enrollments and needs to cover key courses in our undergraduate curriculum. Special thanks to **Katie Glover** (University of Maine) for delivering several gateway courses and twice teaching EES 357, this spring with a cool several-day fieldtrip to New England. Also, we thank **Mariah Hoskins** (Ph.D. EES, 2020), **Leslie Tintle** (M.S. EES, 2019), and **Francesco Pavano** (current EES Postdoctoral Fellow) for their assistance offering our gateway courses. **Mariah** also taught EES 201 in the Fall, 2021 (see the [related story in this newsletter](#)).

## Alumni Corner

**Michaela Ott** graduated from Lehigh with her BA in Earth & Environmental Sciences in 2020, when life took a major turn. From moving back to her childhood home in South Carolina to taking on a new job, post-grad life, to say the least, challenged Ott in so many ways and helped her continue to grow even after her time at Lehigh as an undergraduate student. Because Lehigh stole her heart, Ott is continuing her education through the College of Education and getting a Master's degree in Secondary Education with Certifications in 7-12 Earth & Space Science and K-12 Special Education. She currently works at the Centennial School of Lehigh University as a High School Teacher Associate and could not be more grateful for this opportunity. As Ott embarks on her final year at Lehigh, she looks back with nothing but positive memories that EES and the College of Education have afforded her and all the family and friends who supported her along the way. Ott thanks all her professors, staff, and classmates that contributed to her success and pushed her to strive for excellence. Go Hawks!





# Alumni Corner

**Grant Loescher, BS '18**, is a Realty Specialist at the United States Forest Service where he works to acquire new public lands for the National Forest System in the Southwest. This work has taken Grant to some of the most remote places in New Mexico and Arizona. He greatly enjoys the ability to work outside and complete projects in the public interest. While the work at the USFS is mostly in real estate, Grant also uses a great deal of the things he learned at the School of Earth and Environmental Science. Grant uses GIS daily and it proves to be an incredibly valuable skill set. He also prepares federal mineral potential reports to evaluate the likelihood of geological resources for any potential land transaction.

Before starting at the Forest Service, Grant completed his MS at Arizona State University where he received a fellowship in his first year and worked as a graduate research associate in his second year. At ASU, Grant worked in the GEOPIG lab where he researched experimental hydrothermal geochemistry. Grant's interest in this field was sparked by Jill McDermott's mentorship at Lehigh. The exceptional access to undergraduate research inspired Grant to go to graduate school and continue studying this topic. His graduate work focused on metal-organic interactions at hydrothermal conditions. Part of this research was developing a novel reaction for benzene oxidation and applying for a patent for the process. Grant also conducted fieldwork with his lab group in Yellowstone National Park. Sampling hot springs surrounded by geysers, grizzlies, and bison was a high point of his graduate studies.

He plans to take a break from real estate and return to geochemistry in 2022. Grant is joining a lab in Hamburg, Germany where he will study enhanced silicate rock weathering as a strategy to mitigate climate change. Grant is looking forward to pivoting back into this field and is incredibly grateful for the faculty at Lehigh that inspired his passion for geoscience.



**Jen Schmidt PhD '18**, spent the last year of her PhD as a visiting lecturer at Wellesley College. After graduating, she moved to Phoenix, AZ, with her family and she and her husband welcomed their second child.

Jen stumbled into science writing when she met an editor at the 2019 GSA annual meeting. Shortly thereafter, she started writing freelance science news stories for Temblor, a Silicon Valley earthquake hazard modeling startup founded by former USGS seismologists. As part of the company's public mission, Temblor Earthquake News publishes articles about new earthquake science research and notable seismic events.

In February 2020, Jen started an NSF-funded I-PERF (Innovative Postdoctoral Entrepreneurial Research Fellowship) postdoc with Temblor. The I-PERF program brings science and engineering PhDs from underrepresented groups into tech startups to give them experience in entrepreneurship. As a postdoc, Jen is now the editor and director of Temblor Earthquake News. She solicits and edits stories and helps run an extern program for budding science writers. She is also a member of the company's business strategy team. In May 2020, Jen and her family moved to the San Francisco Bay Area.

Jen is a 2021 AAAS (American Association for the Advancement of Science) Mass Media Fellow. This competitive summer fellowship places PhD students and postdocs at newsrooms throughout the country to gain experience writing for the public. Jen is a science reporter for the San Luis Obispo Tribune and is sponsored by AGU. She writes about the natural sciences for the paper's county-wide audience. While serving as a AAAS fellow, Jen is on leave from her position at Temblor.



## In Memorium

**Dr. Dale Rodekohr Simpson**, 88, passed away on October 18, 2019. Dr. Simpson completed his MS and PhD degrees in geology and mineralogy at the California Institute of Technology before teaching at Lehigh University for 34 years, becoming Professor Emeritus in 1995. He conducted research about teeth and bone mineralization, industrial minerals, and molecular sieves. He is survived by his wife of 61 years and his two children.

His obituary can be viewed at

<https://ompsfuneralhome.com/obituary/dr-dale-rodekohr-simpson/>.

We are filled with great sadness about the untimely passing of **Matt Huff (M.S. 2019)** in September of 2021. Matt was a vibrant member of our EES community, and his humor, positive energy, and passion for science and the natural world had a profound impact on us and everyone he met. He is deeply missed by us all. His obituary can be viewed at <https://obits.nj.com/us/obituaries/starledger/name/matthew-huff-obituary?id=21203667>

## Thank You To Our Donors

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### And a special thanks!

We'd like to acknowledge **Tony and Ellen Imhof** for their annual contributions to the EES Field Camp Fund, over the years, and toward establishing an endowment for long-term support of students enrolled in EES 341. Anthony A. Imhof III, now a retired geophysicist who worked for Chevron Oil and Energy Company and as a geophysical consultant, was in the Class of 1969, receiving a B.A. in Geology. He and Ellen, who also worked at Chevron as a geophysicist, now live in San Francisco.



# An Invitation to Get Involved and Support Your Department

The faculty and staff would like to extend an invitation to alumni to stay in contact with EES and to get involved with your 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 of payment below:

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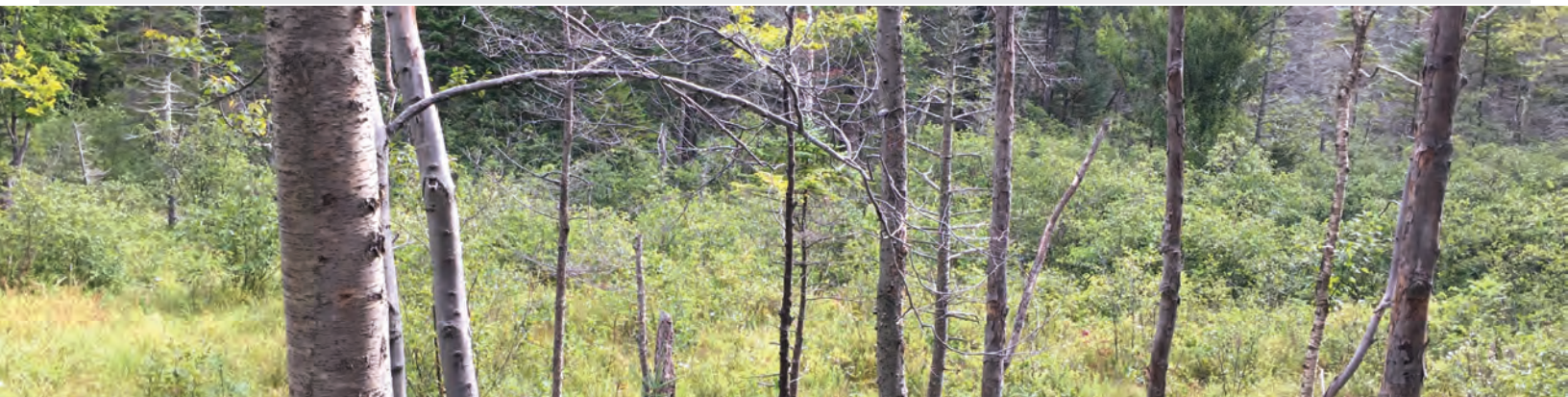
**Mail to:**

Libby Seyfried

Department of Earth & Environmental Sciences

Lehigh University, 1 W. Packer Ave.

Bethlehem, PA 18015-3001



**EES would like to thank sophomore Sophia Mihalek for help with designing this year's newsletter!**