PennState
College of Earth
and Mineral Sciences

Department of Geosciences

Newsletter 2019

From the Department Head

Dear alumni and friends,

I would like to take this opportunity to welcome you to the 2019 Department of Geosciences Newsletter. There have been many notable events in the life of the department this past year, several of which you will find articles about in this newsletter. The past year has been one of transition, as we celebrated the retirement of Russ Graham (p. 9), our museum director, welcomed the new museum director, Jane Cook, and bid farewell to Demian Saffer, who, after fourteen years on our faculty, is moving to Austin, Texas to become director of the University of Texas Institute for Geophysics. And with Demian's departure, on October 1, I became the new department head. The fall has been particularly busy with ongoing searches for new faculty in earth history, hydrogeology, and geomechanics/structural geology/tectonics, and a director of diversity programs. We have also begun working on a new five-year (2020-2025) strategic plan for the department, and in the coming months we will begin an overhaul of the department's website.

This past year, we have embarked on major lab renovations in support of our research enterprise. Spurred by NASA support for a new Astrobiology Center led by Kate Freeman, University funding was made available to construct a world-class isotope geochemistry laboratory, new laboratories for sedimentology, stratigraphy and paleontology, a rock prep facility, a remodeled seismic station, and field prep space for the geophysics and ice groups all in the basement of Deike. New labs for terrestrial paleoecology and crustal petrology are under construction on the fourth floor of Deike, supporting the research programs of recent faculty hires Sarah Ivory (p. 8) and Jesse Reimink (p. 8). And later this year, planning will begin for moving, sometime in the coming two years, the Laboratory for Isotopes and Metals in the Environment (LIME) and other geochemistry labs from Hosler to new lab space on the fifth floor of Deike. Combined, these renovations represent a substantial investment by the University in the department's research infrastructure, for which we are most grateful.

As in past years, in this newsletter we acknowledge the generous support from our alumni and friends (p. 22-25). This support enables many important activities and opportunities for our students which would otherwise not be possible. For example, because of alumni giving we are able to support field trips and diversity programs, offset field camp expenses for students, provide fellowships and scholarships, update teaching laboratories, and purchase field equipment. Perhaps even more important, the relationships that we maintain with our alumni and friends enrich the lives of the faculty and the students. Thank you for your support and continued engagement with our department!

In my new role as department head, I am quickly learning about the breadth of accomplishments not only of our faculty, postdocs, and students, but also of our alumni. The collective achievements of many individuals associated with this department, and the impact they have had on the geosciences, is truly remarkable. I am honored and excited to be given the privilege to lead the department, and I am looking forward to working with all of you to achieve a more inclusive, diverse, and societally-responsive department, while at the same time promoting exciting new educational opportunities for our students and supporting cutting-edge research by all. If you find yourself in State College, please take the opportunity to stop by and reacquaint yourself with our constantly growing and changing department.

Sincerely yours,

Andrew Nyblade

The Geosciences Newsletter is a publication of the Department of Geosciences in the College of Earth and Mineral Sciences at Penn State

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Cover photo courtesy of Chris Marone: Scenes from our graduate-level Penn State Geosciences field trip: A Transect Across the Acadian and Taconic Orogenic Zone: Hudson Valley, NY to the Berkshire Massif, MA. The course is designed to provide incoming graduate students with a broad perspective on the field.

In This Issue...

Students in the Spotlight.....

Doctoral Degree Student: Judit Gozalez Santana

Having been born and raised in a volcanic archipelago, the Canary Islands, I have always been fascinated by the geological processes that operate on Earth, the mechanisms that drive them, and their impacts on society. I further developed my passion for volcano geophysics during a visit to Iceland when I was 16, where I had the chance to meet a Ph.D. student who was using GPS data for volcano monitoring. Ever since, I have been drawn to research involving the study of volcanic hazards through geophysical methods.

I completed my undergraduate and master's degrees in Earth sciences at the University of Oxford, United Kingdom. Throughout those four years, I was able to complement my studies with a series of summer internships that helped narrow my research interests. I participated in a geochemical campaign after the 2011 volcanic eruption on El Hierro and a one-month offshore seismic data acquisition campaign to image the subsurface beneath Mount Etna, Sicily to obtain data for tomographic models. I also participated in a Karst Scene Investigation project in Russia involving seismic, radiologic, gravitational, magnetic, and electric surveys. For my master's thesis, I chose to follow the route of deep Earth seismology, focusing on the topography of the core mantle boundary that would provide me with valuable computing skills. However, I knew I would find it most rewarding to work on science that has direct societal impacts, and having discovered the applications of radar satellite data for monitoring ground surface deformation through my tutor's research, I chose to pursue my Ph.D. with Dr. Christelle Wauthier at Penn State.

My Ph.D. research focuses on flank instability processes at Pacaya volcano in Guatemala, where there is evidence for past flank collapse. My passion for this research is driven by the opportunity to contribute scientific knowledge to hazard assessment that can then be incorporated into risk mitigation. At Pacaya, we rely largely on satellite data to study past flank instability events, which makes my research topic equally challenging and exciting. My main focus is unravelling the deformation behavior of the volcano over time, identifying temporal links with eruptions and other volcanic signals, as well as investigating potential sources of the observed deformation through numerical modeling. In particular, I aim to determine whether there exists a detachment fault within the volcanic edifice, which might facilitate slip and pose a greater threat of flank collapse.

Through taking courses both in the Departments of Geosciences and Mechanical Engineering, the graduate program at Penn State has enabled me to further my understanding of topics relevant to my Ph.D. research. Additionally, I enjoy the opportunity to share my knowledge with younger students as their teaching assistant. My long-term goal is to pursue an academic career in volcano geodesy or become part of a geoscience research institution or volcano observatory so that I can continue to apply my knowledge to solve problems related to natural hazards and risk mitigation.

Master's Degree Student: Timothy Witham

My earliest memory of geology is looking through my father's telescope at the full moon on a crisp autumn night. The town we lived in at the time had little light pollution, and it afforded a wonderfully unobscured view of the night sky. Stepping on my tiptoes to gaze through the eyepiece, transported a world many thousands of miles away to directly in front of me. I observed the deep gouges and craters carved on the lunar surface from innumerable debris impacts. Canyons snaked across the moon in seemingly random patterns. Ancient mountains stood as lonely sentinels guarding the secrets of their formation from all but the most curious eyes. After that night, my imagination was piqued, and I would do anything in my power to find out more about the world around me through science.

Witham Continued....

I soon found out that geology was the perfect fit for an aspiring scientist. Spurred on by several influential geoscientists in my high school and undergraduate career, I realized I wanted to study at the graduate level how rocks change and deform over time. I brought my childhood fascination with me as I began to apply my love of science to geologic questions. My journey led me to study fracture propagation in Penn State's Rock and Sediment Mechanics Laboratory with Chris Marone, professor of geosciences. My graduate research involved performing hydraulic fracturing experiments at the laboratory scale coupled with ultrasonic monitoring techniques. By sending elastic waves across a fracture as it grows, new insights into how open or closed the interface is can be determined. Fracture behavior is still a subject of intense research for industry applications, and I hope to one day apply the knowledge of geophysics I've developed to a career in industry and teaching.

The coursework I engaged in at Penn State also helped me become a stronger young professional. Enrolling in the Imperial Barrel Award competition, led by Liz Hajek, associate professor of geosciences, who served as our team's adviser, gave me a detailed look at how critical a geoscientist's input is to any oil and gas exploration effort. My research and classwork at Penn State allowed me to develop quantitative research skills, such as computer programming and critical thinking. Looking back, I couldn't have developed these skills as fully anywhere else.

Bachelor's Degree Student: James Tierney

My path into geoscience was fairly unintentional. Through high school extracurricular activities, I was introduced to topics such as hydrogeology, seismology, paleontology, and glaciology. Although I was intrigued by these studies, I never gave them much consideration for my future—until it came time to apply to college. Scrolling through the endless list of possible majors, there were quite a few that caught my eye. None stuck out quite like the geosciences. I decided to give the geosciences major a try, and after my first year it was clear to me that this was the right major for me.

Each new professor and class at Penn State has opened my eyes to a different aspect of the field, and my passion has only grown. Over time, my interest has narrowed to environmental geosciences, and I have also become interested in sustainability.

This past fall, I took part in Penn State's Study Away Pittsburgh program, now renamed to City Semester Pittsburgh. This program matches students with community partners and allows the students to work as interns on sustainability projects in Pittsburgh. I was partnered with the Allegheny County Conservation District, working with their urban soils program. This internship consisted of collecting and testing urban soils, analyzing for lead and arsenic contamination—a serious issue in Pittsburgh. Through the results of soil testing, the organization determines whether lots are safe for human interaction. I was shocked by the number of lots that tested unsafe for humans. Most land parcels measured lead concentrations over the acceptable limit of 400 parts per million, with some measuring more than 1,000 parts per million. This experience of working with community members in different neighborhoods of Pittsburgh greatly influenced my interests and led me to add a minor in sustainability.

I am incredibly grateful to Penn State for my experience during the first three years of my college experience. The professors have done an amazing job of developing my knowledge throughout several different areas of the geosciences. Additionally, the faculty in the College of Earth and Mineral Sciences have been fantastic in guiding me toward my interests and keeping me on the right track. The opportunities that I have been presented with over the years, have been unforgettable, and hopefully my final year of undergraduate studies will be even better.

Alumni Spotlight: Randy Cygan '80 '83g

by Peter Heaney, professor of geosciences

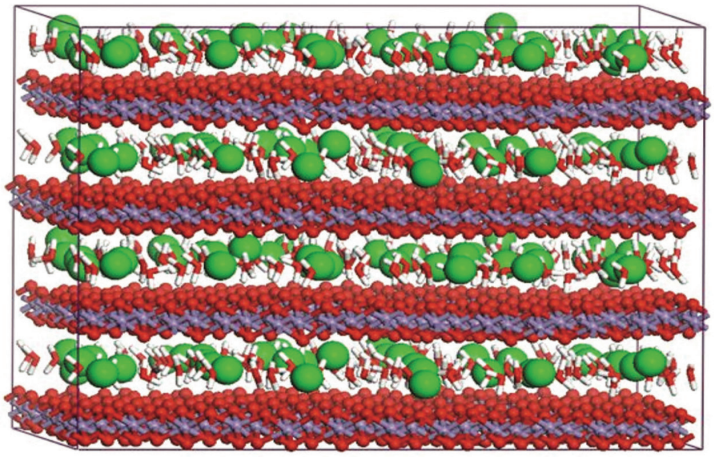
Randy Cygan is a Centennial Fellow of the College of Earth and Mineral Sciences and he served as a member of the department's advisory board from 2012 to 2019. He has been a valued alumni mentor to our undergraduate students seeking career guidance. Cygan received his bachelor's degree in chemistry with a minor in geology in 1977 from the University of Illinois at Chicago (UIC). He first caught the geology bug during his high school years by traveling with family and friends throughout the Midwest, but it grew into a serious avocation during a lab assistantship with Gus Koster van Groos at UIC. Cygan's exposure to the high-pressure synthesis of minerals led him to graduate studies at the world's center for experimental petrology. At Penn State he earned his master's degree in 1980 followed by a doctorate in 1983, both in geochemistry and mineralogy.

While working on high-temperature crystal zoning profiles in metapelites, he discovered the experimental and intellectual resources offered by collaborations with faculty in the Materials Research Laboratory. He credits professors like Carlo Pantano, Rustum Roy, and Will White with teaching him that the interface between geochemistry and materials science offers a wealth of exploration opportunities.

"The materials connection played off how Penn State geochemistry evolved in the 1950s and 60s, and I wanted to keep that bridge going," Cygan said. "It really directed me to where I wanted to go in my professional career."

As a graduate student, Cygan worked on problems that were highly unconventional at the time. However, thanks to efforts like his, they are now part of the mineralogical canon. He developed an impedance spectroscopy system to measure the dielectric response of forsterite at high temperatures and he also was an early user of the ion microprobe, which enabled him to measure trace element profiles with high spatial resolution in minerals that have very slow cation diffusion rates, such as garnet.

Cygan joined the Geochemistry Department at Sandia National Laboratories in 1983, where he worked for thirty-two years, interrupted by a two-year tenure on the faculty of the University of Illinois at Urbana-Champaign from 1987-88. Cygan is probably best known for the sophistication of his computational simulations of mineral structures and reaction interfaces (see illustration). His wide-ranging publications include investigations of mineral equilibria, chemical kinetics, surface chemistry of minerals, adsorption and dissolution of minerals, shock metamorphism, structure and transport properties of battery materials, and molecular modeling of minerals and geochemical processes. Cygan has published extensively in various geological, chemical, and materials science journals and received numerous honors. In addition to many awards for excellence received from Sandia, he is an Honorary Distinguished Alumnus of the Penn State Materials Research Laboratory, a Fellow of the Mineralogical Society of America, and in 2010 he received the Brindley Lecture Award from the Clay Minerals Society.



Molecular model of Na-birnessite ($NaMn_4O_8 \cdot 3H_2O$) derived from equilibrated molecular dynamics simulation.

Cygan is married to Donna Skeels and has two adult daughters, Kate and Nora. Although he recently "retired" from Sandia, he continues to publish papers, attend conferences, and devote time as a mentor to graduate students and research scientists. He holds an adjunct position at Texas A&M University and serves on many university and government advisory boards and committees. In his free time, he enjoys bicycling with friends, hiking in the mountains near his home in Albuquerque, New Mexico, and traveling with Donna, especially to visit their daughters in Chicago and Denver. He has great memories of Penn State, and he is especially proud to have co-founded in 1980 the Geohabs team playing in the Nittany Hockey League.

As Department Head Andy Nyblade observes, "Randy's contributions to the department through his service on the Alumni Advisory Board are gratefully appreciated. It is amazing that Randy has made time to serve and advise the department while he was engaged in such a highly-productive research career. We hope that despite cycling off the advisory board, he continues to offer his creative insights for the department's future."

Alumni Spotlight: Ashlee Dere '09 '14g

by Francisco Tutella

Energetic barely begins to describe geosciences alumna Ashlee Dere.

An associate professor of geology at the University of Nebraska Omaha (UNO), Dere continues to build an impressive research profile while balancing her teaching and mentoring duties, and giving presentations and seminars across the globe.

Dere graduated from Penn State with a master's degree in soil science in 2009 and a Ph.D. in geosciences in 2014. She joined the faculty at UNO after graduation and has since presented her research in places as far away as Paris, France, and Yokohama, Japan.

Dere's research focuses on the drivers of weathering and soil formation and how intensive agricultural land use influences soil structure and function within the critical zone, which extends from the bedrock to the upper extent of the vegetation. She also is an investigator with the National Science Foundation-funded Critical Zone Observatory (CZO) program, established to investigate biogeochemical processes occurring at Earth's surface.

"I really love working with soils and being out in the field digging soil pits and discovering the information that is within them," she said. "Through this research, we can learn how these features formed, what they mean for ecosystems, and how they impact the evolution of the landscapes.".

Dere encourages her undergraduate students to get involved in her soil research, teaching them how to collect water samples and soil cores. She has taken students to field sites near the Omaha campus, in the Appalachian region, and as far away as Puerto Rico, Alaska, and Australia.

"I really like working with students," Dere said. "Being able to bring them out into the field and show them this excitement has been a really fun part of this job."

She first became interested in soils as an undergraduate student at California Polytechnic State University, San Luis Obispo after participating in a soil judging program. The program gives students field experience analyzing, describing, and interpreting soil profiles. She found the experience so rewarding that she started a soil judging team at UNO.

"The university is very much an urban campus," she said. "It's been really fun having students take a chance on something that they aren't familiar with, and seeing them come out after just one week with skills that they can use moving forward in their careers."

Dere credits the training and mentoring she received at Penn State for helping in her early career. She named Susan Brantley, Distinguished Professor of Geosciences and director of the Earth and Environmental Systems Institute (EESI), and Tim White, research professor in EESI, as important mentors. She still stays in touch with both researchers. This summer, Dere and White conducted field work in Alaska and led a critical zone science field school in northern Italy. She still contacts Brantley for career advice.

"I'm so grateful to have this continued guidance," Dere said. "Tim and Sue are so giving of their time and energy."

UNO has recognized her efforts. This spring, the university granted Dere tenure, allowing her to complete the process a year early. She also received the Alumni Outstanding Teaching Award.

Dere has no plans to slow down anytime soon. "Now we have connections with people of different specialties all over the world," she said of the field school in Italy. "We're a bit stronger moving forward and can do more work."

Before coming to Penn State, Dere earned an undergraduate degree in earth sciences at Cal Poly and spent a year abroad studying French at the Université Paul Cézanne Aix-Marseille III in France. Outside the classroom, she enjoys running, traveling, and playing bass flute in a community flute choir.

Welcome New Faculty

Q&A with Sarah Ivory, assistant professor

What attracted you the field? I actually never imagined being a scientist when I was a kid. My first career aspiration was to be a poet. I spent most of my teenage years wandering around my town in northern Wisconsin or writing under a big tree by the Chippewa River. At that point in my life, I appreciated the beauty of plants but took it for granted that they had names and were all different. I ended up being attracted to the field when a desire to be more descriptive of landscapes led me to try and figure out what the plants I was writing about were called. That was a rabbit hole that I still haven't come out of.

What is your educational background? I earned my bachelor's degree from a small university in my hometown, the University of Wisconsin-Eau Claire. I actually got a B.S. in botany and French and worked in France in a research lab for a while after graduating. I then earned my Ph.D. in geosciences at the University of Arizona. I started graduate school having never taken a geology course. There was a lot of catch-up, but my background ended up being a great asset, because geology and biology are so tightly linked.

What are your research interests? I am interested in better understanding how vegetation—individual plants and communities—respond to changes in climate throughout the Quaternary. Also, I am interested in how humans have altered the environment through time and how the environment has shaped humanity. In order to do this, I use plant fossils, especially pollen from flowers to reconstruct ancient vegetation.

Why did you choose Penn State? Penn State is such a great place to be a young scientist. You get to work alongside some of the smartest people in the world, and you get the sense that everyone genuinely wants you to be successful. Also coming from a background that is sort of between disciplines, Penn State really fosters collaboration and relationship-building across colleges and the University itself. I really appreciate that mentality.

Jesse Reimink, assistant professor

Originally from the great state of Michigan, I grew up as the eldest son of two public school teachers, who instilled in me a deep appreciation for academic, athletic, and educational pursuits. For my undergraduate studies, I attended Hope College, a small liberal arts college, where I majored in geology and played basketball, a sport that remains a major part of my life. After graduating, I started in an M.Sc. program at the University of Alberta, focused on mapping and geochemistry within the Acasta Gneiss Complex, Northwest Territories, Canada, which evolved into a Ph.D. project that I completed in 2015.

My father was a high school biology teacher, who worked on research programs involving schistosome parasites in lakes in northern Michigan. I was raised around science and the outdoors to the extent that I thought to pursue biology like my father. However, in ninth grade I took the required Earth science course, taught by Chris Bolhuis, an incredibly dynamic educator who won the 2013 Earth Science Teacher of the Year award from the American Association of Petroleum Geologists. This course, combined with his geology course that I took in eleventh grade, set me down the path toward Earth science as a profession.

I became interested in geochemistry during my undergraduate studies when I worked as a research assistant for two summers studying copper-mineralizing fluids in the Midcontinent Rift and mapping high-grade gneiss terrane in the Sveconorwegian orogeny exposed in Sweden. This translated nicely to my work in the Northwest Territories that used mapping and geochemistry to evaluate the origins of continental crust in deep time.

Before coming to Penn State, I was a postdoctoral fellow for three years at the Carnegie Institution for Science in their Department of Terrestrial Magnetism., where I continued to work on early crust formation and various problems related to the early Earth.

Recently, I have started to work on a technique-development project that, if successful, will improve mass spectrometry techniques used by a wide variety of analyses in the fields of geochemistry, geochronology, and nuclear forensics.

I am incredibly honored and excited to be a part of the Penn State's Department of Geosciences and remain sufficiently intimidated and motivated by the prospect of joining such a prestigious program. I plan to continue to work on early Earth geochemistry problems and hope to assist in bringing new analytical facilities to the department while contributing to the broader goal of geosciences education.

Saying Goodbye...

by David Kubarek

EMS museum director Graham 'loved it' for 42 years

Russell Graham, who oversaw the College of Earth and Mineral Sciences' EMS Museum and Art Gallery for the past fifteen years, retired on May 31. He was succeeded by Jane Cook, former chief scientist at the Corning Museum of Glass.

Anyone who's perused one of the museum's many rotating exhibits—The Lure of the Mine and The Bearded Lady Project come to mind—know of Graham's impact. It's the same for any eager middle-schooler who's ever created tornadoes with their fingertips or stomped their feet near an accelerometer to force mini earthquakes.

Fewer know about Graham's decades of experience gathering, preparing, and maintaining exhibits for the Smithsonian Institution, the Illinois State Museum, and Denver Museum of Nature & Science, before coming to Penn State to oversee the transformation to a modern, professional museum.

Or of his most acclaimed discovery, finding stone tools used by the Clovis culture—a prehistoric Paleo-American culture and one of the first people to live in North America—during a dig in Missouri, which to date is the only evidence that the group hunted forest-dwelling mastodons. The site of the excavation has since been transformed into the Mastodon State Historic Site and State Park.

"I've been working for forty-two years, and it's the diversity and fun that keeps me going," Graham said. "I've had the opportunity to do scientific research and I love discovering new things. You get to interact with the public so you're not just sitting in your office or laboratory. You're telling people about the work you do and trying to get them turned on to research and science. From your research, you create exhibits, which brings out your creative side."

Modernizing the museum

Through grants and elbow grease, Graham oversaw the inventory, safe storage, and restorations of much of the college's vast collection. The museum is home to more than 18,000 geological specimens, thousands of mining safety and other extraction industry artifacts, and numerous paintings that began with artwork from former EMS Dean Edward Steidle's personal collection.

Graham said it was reviewing these paintings in preparation for the book, The Wonders of Work and Labor, published with help from Julianne Snider, the museum's assistant director of exhibitions and collections, that made him realize how unique and special the collection was. So did creating a digital inventory of the collection, where his staff examined each specimen piece by piece.

Parts of the museum's collections are on display across the world, and Graham said a completed digital archive will only expand those opportunities.

Graham said restorations to the Steidle Art Collection—made possible through gifts from the Steidle family—unearthed new details in the works. The inventory process also exposed him to some of the more peculiar items in the collection. For example, the museum houses specimens of a material called trinitite, which was created during above-ground nuclear bomb testing in the United States just after World War II. It also owns one of the first furnaces used to conduct experiments for understanding volcanism. In it, rocks were heated to magma and cooled; then the new formations were analyzed.

The collections, once housed piecemeal throughout the campus, are now safely stored in a climate-controlled building near the University Park Airport.

Life after museums

Graham said there's much he'll miss about museums. He'll miss developing eye-catching and accessible exhibits.

But retirement will free up more time to continue research and writing.

"I'll be staying involved at a much more leisurely pace while working on the backburner projects that I've always wanted to do." Graham said. "I've really enjoyed my job and engaging with students and the public. It's been fantastic. I wouldn't have stayed in it as long if I didn't love it."

Geoscientist Contributes Expertise to New Smithsonian Exhibit

by Gabrielle Stewart

When Erin DiMaggio was an undergraduate student, she had a summer internship with the Smithsonian National Museum of Natural History. Little did the 19-year-old know then that one day she would help develop a permanent exhibit for the museum.

DiMaggio, now an assistant research professor of geosciences, has an exhibit featured in the museum's "The David H. Koch Hall of Fossils - Deep Time," which reopened this summer.

Closed in 2014 for remodeling, the new, immersive 31,000-square-foot dinosaur and fossil hall explores the story of Earth's deep past and tracks the history of life on this planet.

Visitors to the "How Do We Date Fossils?" exhibit are greeted by a large headshot of DiMaggio smiling and photos of field work in Africa. Informative panels teach visitors about the primary methods of dating; relative dating—a method that uses the position of fossils within rock layers to determine their age—and absolute dating—the method that uses radioactive minerals in rocks as geological clocks.

"This exhibit addresses how we look for clues in the surrounding rocks to determine the ages of fossils," said DiMaggio. "The display explains both relative and absolute dating methods. For example, the decay of potassium-40 to argon-40 is an absolute dating method we often use to date rocks in Africa that contain fossils of early humans."

After learning about dating, visitors can test their knowledge with the "Fossil Dating Game," where opening drawers in simulated "rock layers" can provide clues for aging a fossil.

To DiMaggio, having an exhibit in the reopened hall was a rewarding return to the Smithsonian.

"My internship at the Natural Museum of Natural History jump-started my career in research. Working with high-level

The newly opened David H. Koch Hall of Fossils–Deep Time at the Smithsonian National Museum of Natural History explores Earth's distant past and future. Image: Smithsonian Institution

researchers at such a young age gave me the confidence needed to pursue a career in geosciences," DiMaggio said. "It is quite a rewarding experience to return and see your face and research featured in one of the exhibits."

DiMaggio earned three degrees, all in geological sciences: a bachelor of science from the University of Michigan in 2004, and a master of science in 2007 and doctorate in 2013 from Arizona State University.

Her research focuses on two- to six-million-year-old sedimentary rocks and volcanic ash layers in Ethiopia and Kenya. The sedimentary rocks she studies contain fossils of vertebrate fauna, including those of early humans, making these areas important places for studying human evolution.

The National Museum of Natural History is one of the most visited natural history museums in the world. Opened in 1910, the museum is dedicated to maintaining and preserving the world's most extensive collection of natural history specimens and human artifacts. For more information about the David H. Koch Hall of Fossils - Deep Time, visit https://naturalhistory.si.edu/exhibits/david-h-koch-hall-fossils-deep-time online.

DiMaggio's fossil dating exhibit engages visitors hands-on with dating methods. Image: Erin DiMaggio

Patzkowsky Elected Fellow of the Geological Society of America

Mark Patzkowsky, professor of geosciences, was elected a 2019 Fellow of the Geological Society of America (GSA). He was recognized as a newly elected Fellow during the society's annual meeting in Phoenix earlier this fall.

Being elected as a Fellow is an honor given "in recognition of a sustained record of distinguished contributions to the geosciences and GSA through such avenues as publications, applied research, teaching, administration of geological programs, contributing to the public awareness of geology, leadership of professional organizations, and taking on editorial, bibliographic, and library responsibilities."

Patzkowsky was selected as a Fellow for "advancing of the field of paleobiology by establishing ground rules for rigorous interpretation of the field and database paleontological record and applying them to further our understanding of extinction, radiation, function and habitability of the whole ecosystem in deep time."

Patzkowsky uses field data and quantitative methods to address a wide range of questions in stratigraphic paleobiology and evolutionary paleoecology. Currently, he seeks to link paleoecology with phylogenetics to understand the ecological and evolutionary consequences of diversification and mass extinction.

Patzkowsky was also elected a Fellow of the Paleontological Society in 2014 and he received the Distinguished Service Award in 2011. Patzkowsky won the Palaeontological Association's Best Paper Award in 2015. He is the editor-in-chief of the journal Paleobiology.

Patzkowsky joined the Penn State faculty in 1992. He presently serves as the associate head of graduate programs and research in Department of Geosciences.

Patzkowsky received his bachelor's degree in geology from Kansas State University, his master's degree in geology from Indiana University and his doctorate in geophysical sciences from the University of Chicago.

Research Predicts Size, Magnitude, Timing of Lab Earthquakes

by David Kubarek

For the first time, the magnitude, time, and duration of earthquakes in a laboratory setting were predicted by a team of researchers from Penn State and Los Alamos National Laboratory.

This research improves our understanding of earthquakes and could eventually lead to prediction measures in real-life scenarios, according to Chris Marone, professor of geosciences, and the team of researchers who published their results in a recent issue of Nature Geosciences.

For decades, researchers have been able to create earthquakes in a lab setting. However, finding a pattern of when they will occur has remained elusive. For this work, researchers used machine learning—a computer-based approach to data analysis—to probe for the missing cues.

The machine learning approach predicted when the earthquakes would strike by looking at acoustic signals generated each time the earth like medium moved. The acoustics showed a pattern of increasing intensity as the lab earthquakes ramped up in strength. These acoustical signals have long been considered noise, especially early in the earthquake cycle, because a pattern proved difficult to find.

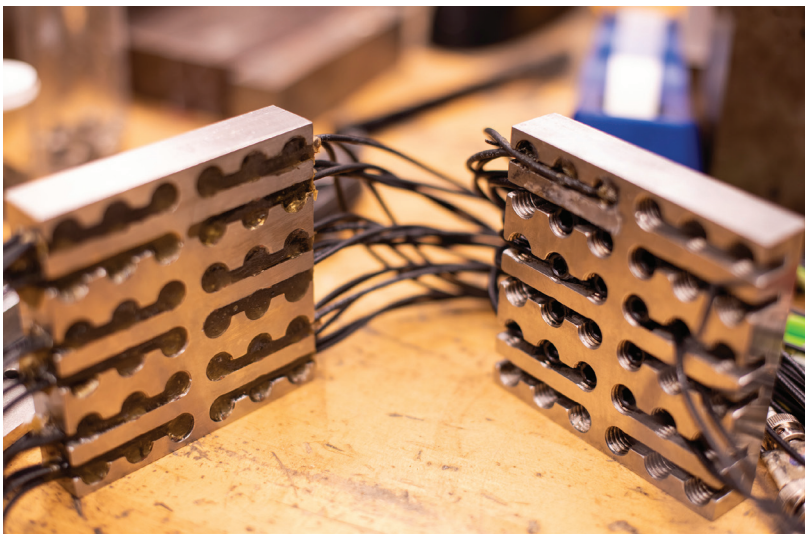
"You can make earthquakes in the lab in such a regular fashion that you can kind of predict them but that's not what was happening," said Marone. "Machine learning keyed us into listening to the sounds that are coming out of the fault. The method tells us when the next earthquake will occur and how long until the following one comes."

A series of earthquakes was created in the lab by sandwiching a layer of sheared granular material between two pieces of rock. The researchers created both slow- and fast-slip earthquakes to understand if the mechanics of each were similar.

Fast-slip earthquakes, which are thought of as traditional earthquakes, operate at high speeds and can cause massive amounts of damage to structures. Slow-slip earthquakes operate in a similar fashion but at speeds hundreds to thousands of times slower. For example, a fast-slip earthquake might last for seconds as fault surfaces rip past one another. However, a slow-slip event could take months to cover the same distance along fault lines. Traditional earthquakes have been studied for many decades, yet slow earthquakes were just identified about two decades ago.

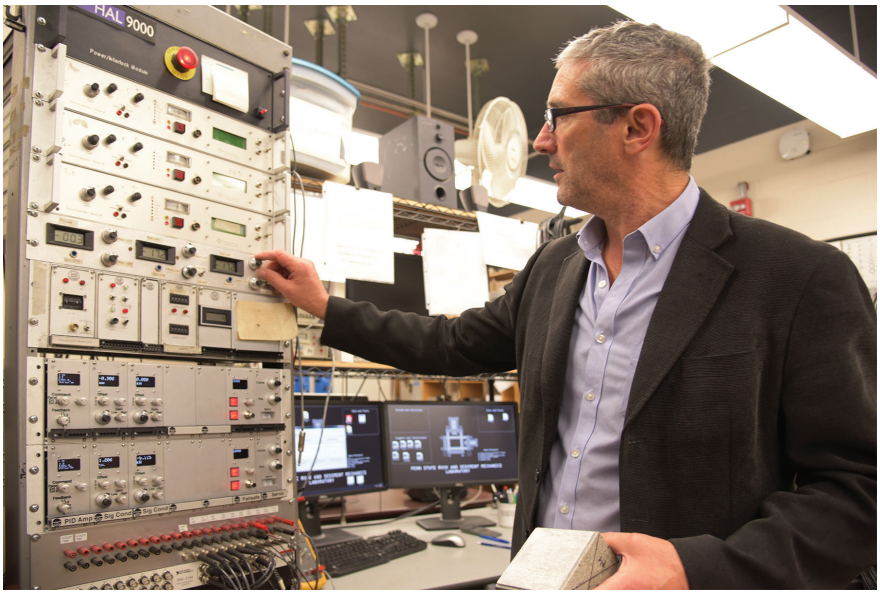
This research shows that the mechanics of each, and the methods for prediction, are the same.

A rock sample is sandwiched between sensor-equipped steel plates prior to testing.



Acoustic sensors, (black wires) attached to the steel plates, detect the minute sounds emitted when rock samples deform and crack under pressure.

Seismometers capture acoustic signals, so most areas susceptible to earthquakes create the same data used in these lab predictions. However, researchers do not yet know if the same methods will work in a real-life setting because the current approach requires a series of similar earthquakes to train the machine learning algorithm. This method could work in places such as the Cascadia subduction zone in the U.S. Northwest, where a string of earthquakes has occurred within the past decade, however most earthquake-prone regions are less active.



Using machine learning, Chris Marone and his team found that acoustic emissions generated during shear of quartz fault gouge under normal stress of 1–10 MPa predict the timing and duration of laboratory earthquakes.

"It's not clear if our technique will work in the field because there are very few places on Earth where we have had multiple, similar earthquakes in the same place, but we're going to find out," Marone said. "Most times, the earthquakes on a tectonic plate boundary are all different. A famous example is the San Francisco earthquake of 1906. That hasn't occurred since."

Looking at any prediction measures could point researchers in the right direction, Marone said. His group is now applying the same machine-learning techniques to probe other ways of predicting earthquakes. This new research could yield methods that require less data.

"Right now, we're taking our lab data and applying different machine learning approaches to see if we can spot some transitions or characteristics that yield the same results," Marone said.

Claudia Hulbert, Bertrand Rouet-Leduc, Paul Johnson and Christopher Ren, of Los Alamos National Laboratory, and Jacques Rivière and David Bolton, of Penn State, contributed to this research.

The U.S. Department of Energy and the National Science Foundation supported this research.

The biaxial earthquake machine in the Rock and Sediment Mechanics Laboratory, uses steel blocks driven by horizontal and vertical hydraulic pistons to simulate conditions on natural faults.

Annual Graduate

Point Arena Lighthouse, Point Arena, California; Alex Neely

Taroko National Park, Taiwan;
Julia Carr

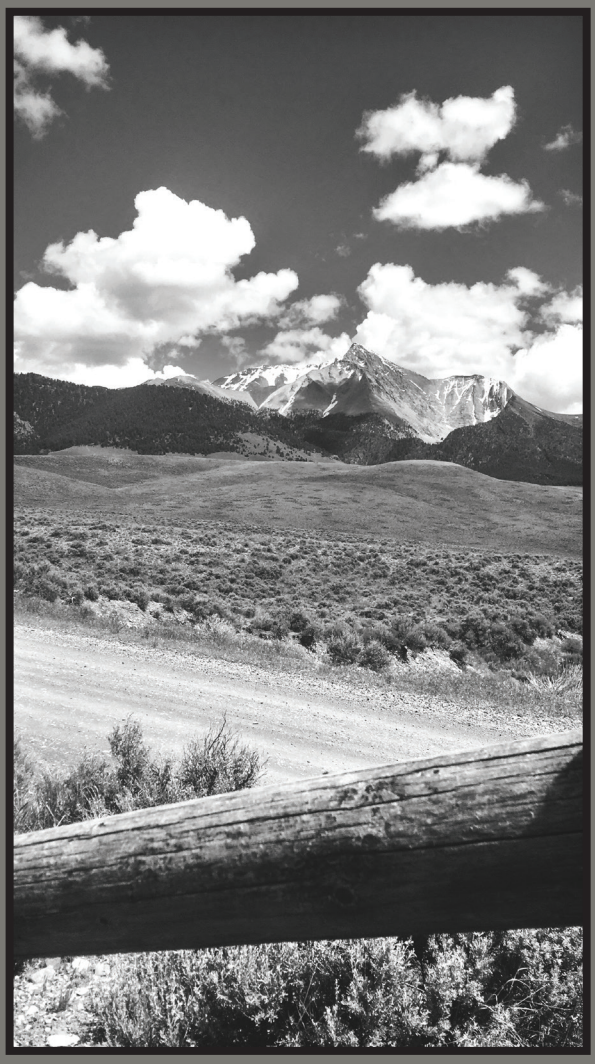
Photo credit: Jacob Cipar

Black Canyon, Gunnison National Park; Jonas Kinter

Colloquium Photos

The Bay of Fires in Tasmania, Australia. The coastline is formed from granite boulders covered in an orange lichen; Allison Karp

Taggart Lake in the Grand Tetons National Park, Wyoming; Kirsty McKenzie



Borah Peak, the highest mountain in Idaho. It was taken on June 29, 2018 as part of Penn State's 2018 Summer Field Camp; Marit Wyatt

Looking back along Route 1 towards Stöðvarfjörður en route to Herðubreið volcano for sample collection, Eastfjords, Iceland; Collin Oborn

Fiber Optic foR Environmental SEnsEing (FORESEE) project

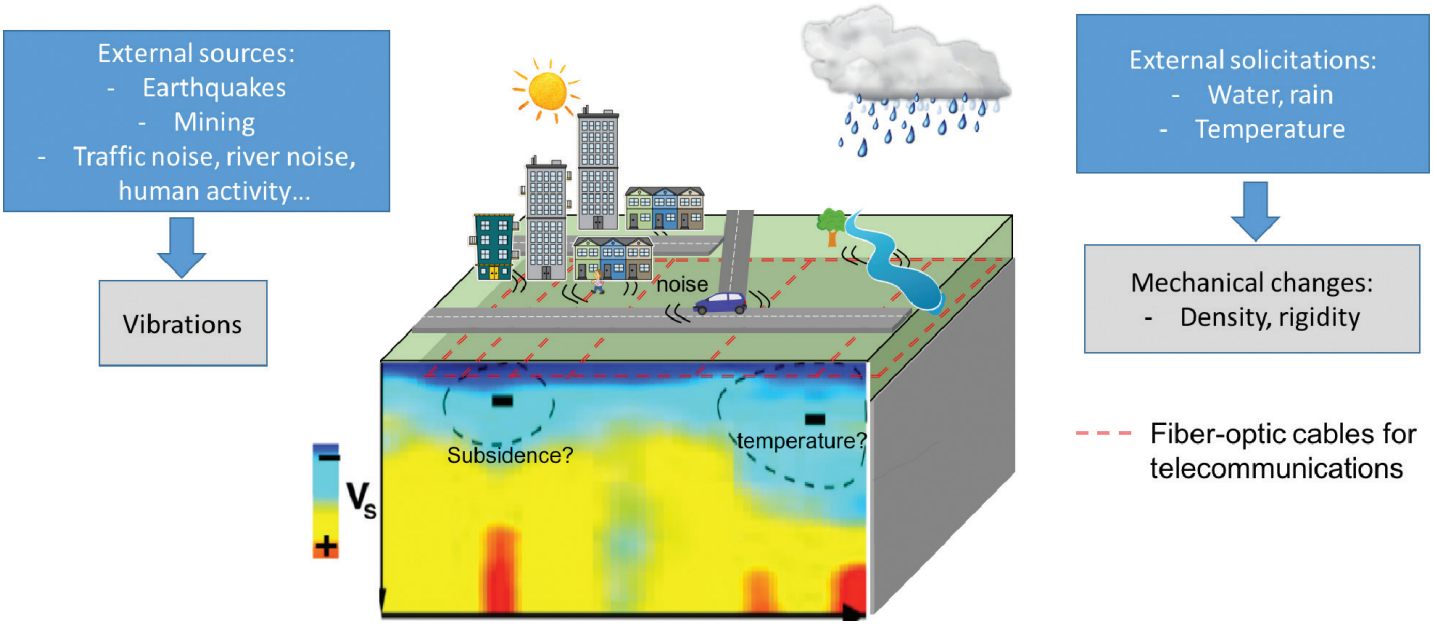
by Tieyuan Zhu, assistant professor of geosciences

The Fiber-Optic foR Environmental SEnsEing (FORESEE) project, led by Tieyuan Zhu, assistant professor of geophysics, collects high-resolution acoustic vibration data using underground telecommunication fiber-optic cables under Penn State University Park. The data allows researchers to monitor in real-time near surface environmental systems for external impacts from earthquakes, land subsidence and sinkholes, and extreme weather events, like heavy rainfall and drought. This project is funded by an Institutes of Energy and Environment (IEE) seed grant (April 2019 – June 2020).

Beginning in April 2019, the researchers used a distributed acoustic sensing (DAS) array to tap into one strand of a pre-existing fiber-optic cable run underneath the University Park campus. The pre-existing fiber cable for telecommunications are directly laid in the concrete conduit at a depth of about three feet. The DAS array made continuous strain rate measurements at a 500 Hz sampling frequency with a thirty-two-foot gauge length along the 14,000-foot length of the fiber-optic cable.

The DAS interrogator technology enables researchers to convert the telecommunication fiber-optic cables to an array of acoustic sensors that provides continuous measurements of strain rate fields in space and time. Compared to seismometers, the fiber-optic sensor array is composed of up to tens of miles of fiber-optic cable that can use the pre-existing infrastructure widely installed in urban and suburban areas. Fiber-optic cables make ideal sensors that are inexpensive, flexible, insensitive to electrical noise, and can be left in the ground virtually undisturbed for long-term, real-time studies.

The real-time fiber-optics monitoring data will capture the seasonal variations of natural events and near-surface environments in State College, Pennsylvania, which experiences severe storms and flooding in summer, and long-term threats from land subsidence, or sinkholes. The researchers expect this fiber-optics monitoring data to provide an assessment of the impacts of natural events on communities, and further improve our understanding of the coupling effects between atmosphere-Earth-human systems. The project will also lead to increases in the early warning capabilities for decision-makers by helping them to be more aware of subsurface environmental changes before costly infrastructure failures occur.



Conceptual diagram of urban/suburban near-surface environmental monitoring using a DAS fiber-optic array. Continuous ambient noise generated by environment and infrastructure use generates surface waves which are detected by DAS and inverted for shear wave velocity profiles. Mechanical change zones are flagged using zones of decreased shear wave velocity.

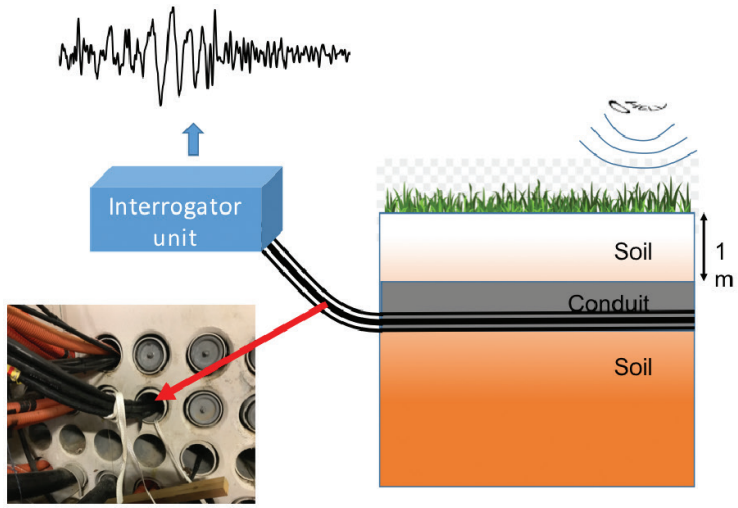
This project involves early-career faculty, graduate students, and undergraduate students. The researchers plan to partner with Penn State's Data Commons to make the data and results publicly accessible to urge more researchers in the geophysics, civil and environmental engineering, and data science communities learn to work with fiber-optic sensing data.

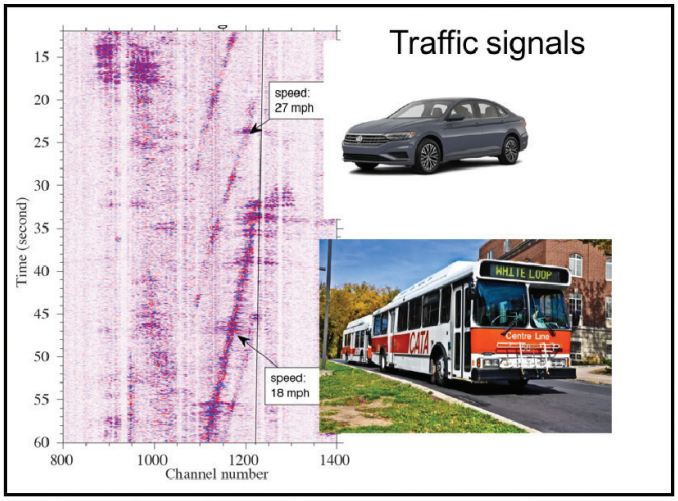
To date, the fiber array recorded a variety of different vibrations, like human steps, traffic signals, concerts, and earthquakes.

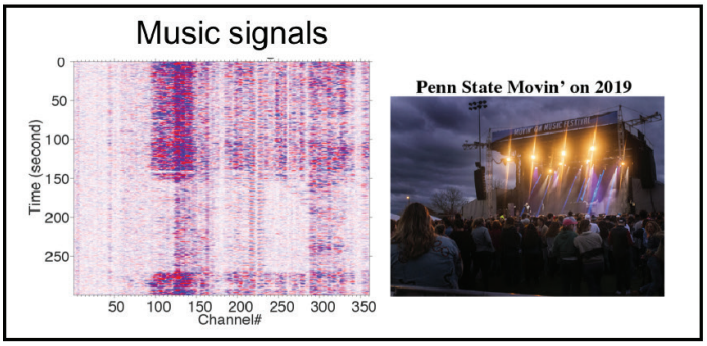
The scientists' recent study showed that the FORESEE array can detect and track thunderstorms associated with lightning strikes.

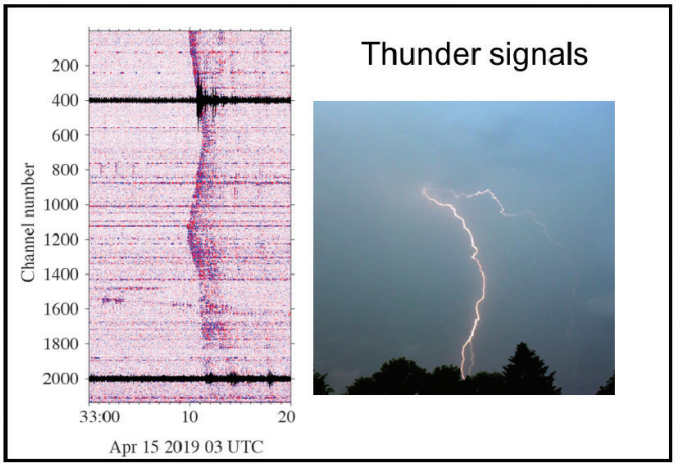
For more information, visit the project website: https://sites.psu.edu/tzhu/foresee/

Penn State fiber-optic distributed acoustic sensing (DAS) array map. Red dots indicate our tap test locations.









Cartoon of DAS array connecting existing fiber optics. The left-bottom subfigure shows the pre-existing fiber-optic cable (in black) used for this project. Examples of DAS fiber-optics recordings.

Geosciences Field Camp 2019

by Don Fisher, professor of geosciences

Top of Flagstaff Mountain during the first day of the Alta overthrust project.

In early June 2019, the Penn State Geology Field School began the annual trip out West for a six-week investigation of the geology of the intermontane western United States, with thirty-six students. The group was led by professors Erin Dimaggio, Roman DiBiase, Donald Fisher, Maureen Feineman, Andrew Smye, and Kevin Furlong, and assisted by a team of graduate teaching assistants led by Julia Carr and including Tsai-Wei Chen, Troy Ferland, Collin Oborn, Kalle Jahn, Clarissa Crist, Jacob Cipar, and Kirsty Mackenzie.

The first stop was the Yellowstone Bighorn Research Association's facility on the eastern side of the Beartooth uplift near Red Lodge, Montana. The students received training in ARC-GIS from Dimaggio and completed mapping and stratigraphy exercises in Elk Basin where they learned to interpret satellite imagery and topographic data, think critically in three dimensions, and collect and report geologic data.

The caravan then passed through Yellowstone National Park and spent a week based in Teton Village, where students mapped Quaternary geology and fault scarps along the Teton mountain front with DiBiase. Students combined a field investigation of the landforms characteristic of glaciated landscapes using satellite imagery and lidar-derived topographic data to establish the geologic history that gave rise to the geomorphology.

Fisher then took students to east-central Idaho where they camped in the metamorphic core complex of the Pioneer Mountains and mapped faults, unconformities, and volcanic deposits to craft arguments for the relative timing for the area's deposition, folding and faulting, erosion, and volcanism.

For the final two exercises, the group traveled to Little Cottonwood Canyon, Utah. As in past years, the students completed a map and cross section of the overthrust belt to estimate the shortening and fault slip due to thrust faulting and stratigraphic repetition. Snow prevented mapping in the Albion Basin, so Smye and Furlong led the last exercise in a new area near Brighton. Students identified and located metamorphic isograds in the field that are used to estimate peak temperature changes with distance from the Alta Stock. Thermal models are then used to place constraints on the dimensions of the pluton and the crustal conditions during cooling.

Top left: Erin Dimaggio introduces the first exercise in Elk Basin.

Bottom left: Don Fisher discusses the Borah fault scarp, Basin and Range extension, and the use of faults for paleoseismology.

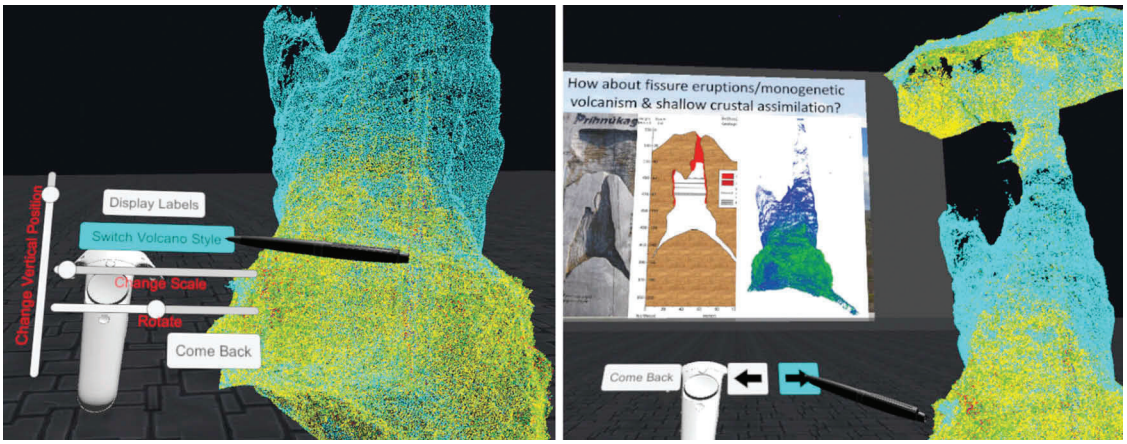
Right: Roman DiBiase lectures in the Teton National Park.

Bringing the Classroom to Life

by Peter LaFemina, associate professor of geosciences

Imagine students walking into the Fletcher L. Byrom Earth and Mineral Sciences Library or the Pattee and Paterno libraries, entering a virtual reality (VR) lab, and seconds later being transported to the inside of a volcano in Iceland. VR experiences allow students to map sedimentary rocks along U.S. Route 322 or investigate metamorphic rocks in the French Alps. These immersive VR field trips (iVFTS) have become reality through a University Strategic Plan seed grant to Peter La Femina, associate professor of geosciences and colleagues in the College of Earth and Mineral Sciences, and across Penn State University Park and the Commonwealth. Field experiences are an integral part of the geosciences undergraduate cuuriculum, including the department's six-week capstone field camp. However, field labs at the undergraduate level are often limited to regions that can be reached within the several hour lab period, subject to permissible weather, are not always easily accessible to students with disabilities, and are not always available to students at all Penn State campuses. Immersive virtual experiences and field trips allow for the delivery of place-based content and exercises, training in field techniques, and field opportunities at global geologic sites.

La Femina, Alex Klippel, professor of geography, and students, initiated their study of iVFTs by developing a virtual experience of the Thrihnukagigur volcano in Iceland, where La Femina and students had collected terrestrial lidar and photogrammetry data and geologic samples of the monogenetic volcano. The volcano formed roughly 3,500 years ago, and during its eruption, lava drained back into the system, leaving the eruptive conduit open. Today, tourists pay to travel about 400 feet into the Earth to see the inside the volcano. La Femina and his students wanted to study how this system formed and what insights it could offer regarding the formation of monogenetic volcanoes globally. They spent a week mapping the inside and outside of the volcano with lidar, as well as taking photographs used to develop a photorealistic model of the volcano. Importing the 3-D lidar and photogrammetry data into VR software allowed the team to investigate regions of the inside of the volcanic system not directly accessible and map the geology and magmatic features.



The menu for Thrihnukagigur volcano visualization allows the user to transform and to display different types of attribute information (left), and a sample page of a PowerPoint presentation is projected onto the boundary surface of the virtual space (right). Users can turn pages via arrow buttons attached to the left controller.

This first immersive experience led to an idea to develop, test, and assess iVFTs for GEOSC 001, Physical Geology and, later, to the Strategic Planning seed grant. In Fall 2017, the team developed the first iVFT, based on an existing Reedsville-Bald Eagle field lab. In this lab, students investigate changes in the paleoenvironment through observations of grain size, bedding thickness, color of the sedimentary rocks, and the existence and type of sedimentary structures. Additionally, students are asked to produce a roughly six-foot stratigraphic column of the Reedsville Formation, which has recurring sequences of turbidites or tempestites. For the virtual field experience, 360-degree images were taken and a photorealistic 3-D model of the Reedsville Formation in Centre Hall was created using photogrammetric techniques. The 360-degree images allow the students to walk in front of the outcrop and investigate the stratigraphy, and the 3-D model allows students to measure a section and make detailed observations of the strata. The students in the iVFT, therefore, are able to experience the same lab exercise as students in the field lab. The development of this iVFT has proved fortuitous, as the outcrop is currently unavailable due to expansion of U.S. Route 322. La Femina, Klippel, and collaborators have now tested the iVFT over four semesters, offering the experience to seventy-five students and to a section of GEOSC 001 offered at Penn State Harrisburg.

The team has also developed an iVFT for the Salona Formation located along U.S. Route 322 in Boalsburg, Pennsylvania and is currently developing a regional geology field trip and additional experiences that can be used in other undergraduate and graduate courses.

Parizek Lane: What's Behind the Name?

by Richard Parizek, professor emeritus of geosciences

Editor's note: Penn State's Living Filter was established in 1962 after a release University's sewage treatment plant caused an extensive fish kill in local streams. An interdisciplinary committee was formed in late fall 1961 and tasked to develop a wastewater renovation system that used nearby agricultural and forested lands as the tertiary treatment process for the University's wastewater. The implementation required considerable research to determine the best management scenario for nutrient loading to prevent groundwater contamination or surface runoff. Richard Parizek, professor emeritus of geosciences, is the only living or active member of the original committee. The following is his account of the work that went into the Living Filter.

Last June, after one of his usual energizing, longest-possible commutes to work, Richard Alley let me know that he discovered Parizek Lane and Water Doc Lane while biking through a former section of State Game Lands 176 near Toftrees on one site of Penn State's Living Filter. An email exchange sent to his ice physics colleague and my son, Byron Parizek, was followed by rapid-fire emails to the extended Parizek clan with banter such as "Parizek Lane, Water Doc Lane, Fracture Trace," ...and how could he resist, "How much is needed for a 50-yard season pass, or to name a building?.... My check is in the mail"... So, I thought I would share what is behind the name.

Many former undergraduate and graduate students in the Department of Geosciences, and its predecessors: the departments of Geology, Mineralogy, and Geophysics and Geochemistry; and later the departments of Geology and Geophysics, and Geochemistry and Mineralogy; will recall wage or assistantship support contributing to the research and design of the Living Filter from 1962 to 1976. During this time, about 20 percent of University Park secondary effluent was applied experimentally to forests and cropland, first during the growing seasons from 1963 to 1965, then year round at a 2-inch per week effluent irrigation rate, having experimented with 1-, 2-, 4-, and 6-inch rates. Others joined after 100 percent—up to four million gallons per day (mgd) of effluent—was applied on a routine basis starting in 1983. Ronald A. Landon '63g, Frank T. Carrucio '63g, and John H. Clark '65g were the first to update portions of Butts and Moore's 1938 15-minute quadrangle map of Bellefonte, Pennsylvania. Their geologic and first-ever water table maps were prepared to search for land suitable to expand the Living Filter to treat all campus effluent should the research prove successful. Some of the Commonwealth's first environmental hydrogeologic mapping studies were undertaken by Ed W. Meiser '71g, Jim Eby '75g, and Phil M. Hunter '77g. Bill R. Gough '75g completed geologic and hydrogeologic mapping of the entire Spring Creek drainage basin including its extension beyond Milesburg, Pennsylvania. More than 2,400 wells and springs were inventoried to produce the first basin-wide water table map, providing physical evidence for the limits of the Spring Creek groundwater basin. Lake Erie was not the source of Bellefonte's Big Spring after all. These theses supported M. Todd Giddings' '74g detailed hydrologic budget study of the Spring Creek Basin, some 145 square miles of surface watershed and 175 square miles of groundwater basin; and Lenny F. Konikow's '69g investigation of mountain sources of recharge. Although Bald Eagle, Nittany and Tussey Mountains comprise only about 20 percent of the watershed, mountains contribute more than 60 to 70 percent of annual basin recharge.

Improving gauging procedures showed Big Spring discharge was nearly sixteen mgd, not ten mgd as displayed on the entrance-gate brass plaque. Professor Emeritus of Geochemistry William B. (Will) White's graduate student Evan T. Schuster '71g and Roger J. L. Jacobson '73g confirmed geochemical residence of its waters within the Gatesburg Dolomite, despite the spring's resurgence within the Axemann Limestone. This was consistent with the regional groundwater trough that extended to, and even beyond, the Scotia ore pits nearly to Halfmoon Creek. State College could tap Big Spring without a direct pipeline connection, after all.

The fracture trace and lineament method for groundwater prospecting, published in 1964 by Laurence Lattman, a geosciences educator who taught at Penn State from 1957 to 1970, and Parizek, and its numerous other geotechnical applications were first developed during hydrogeologic site characterization investigations for the Living Filter and efforts to locate highly responsive onsite monitoring wells. Geologic variables that contribute to porosity and permeability of folded and faulted Appalachian carbonates were investigated to predict groundwater flow and possible transport of nutrients from below spray fields and for well siting. Richard E. Smith's '66g petrographic investigation of the Gatesburg Dolomite received the American Association of Petroleum Geologists best paper award. Similar analyses were conducted by Henry Rauch '72g, advised by White, on Middle Ordovician Series carbonate rocks that contained all known mappable caves within central Pennsylvania, followed by Charles E. Brown's '77g petrographic analysis of intervening carbonate rocks within the region. Structural, stratigraphic, and topographic controls on well yields were advanced by Shams H. Siddiqui '69g, adding to Parizek's thirty-six variables that contribute to karst hydrogeologic properties and phenomena.

Seismic studies supervised by Penn State faculty members Shelton Alexander, Roy Greenfield, and Peter Lavin and a cadre of students were conducted to further characterize soil thickness and weathered rock surface at potential spray field

sites. Imagine these "party types" with graduate students playing with dynamite as the seismic energy source.

Walter F. Ebaugh '73g evaluated the shallow soil temperature survey methods in an attempt to define Miller's cave within the Rock Springs watershed. The watershed was also investigated by Kristen L. Underwood '94g for pesticide and nitrate mobility within a conduit-flow dominated watershed. Frank (Tuck) Mooreshead '75g investigated streambed infiltration along Buffalo Run, while Robert M. Cohen '82g applied the Living Filter irrigation concept to treat leachate from the Borough of State College landfill. Foliage turned the color of iron oxide long before fall and this trench and cover landfill was shown to be not so sanitary by Burke E. Lanes' '69g vadose zone leachate study, later expanded on by Mike Apgar '71g, advised by Don Langmuir.

Michael Smith '86g further constrained recharge estimates to carbonate aquifers and shale beds in the Centre Region using a digital overlay method. Following Reginal W. Spiller's '79g statistical analysis of lineament-related well yields, Gail M. Banwell '86g demonstrated that major lineaments had deep structural roots through helium and radon isotopes in soil, gas, and groundwater studies. Fracture zones hydraulics were quantified by R. K. Weiss '89g and J.M. Kim '96g. Chris A. Shuman '78g investigated similar Appalachian orogen fracture zones using geologic features and multi-scale remote sensing imagery, while Chi Van Chin '96g compared U.S. Environmental Protection Agency wellhead protection delineation methods for the Living Filter and surrounding areas using digital overlay, flow, and transport modeling procedures. The unexpected widespread occurrence of radon in the Commonwealth led to James O. Rumbaugh III '83g use of a radon isotope to estimate fracture permeability in the Reading Prong, and to Richard R. Marvin's '89g radon soil gas mobility study driven by meteorological and water table fluctuations at Houserville.

Back at the spray fields, Michael O'Driscoll '94g evaluated cold temperature effects on slow rates of effluent application and various methods for determining recharge near the spray field. Jennifer Nemitz '01g began important investigations of nitrate removal during overland flow and within effluent enhanced wetlands. She continued the important work of Heide M. Smidansty '04, who was the first to investigate occurrence and transport of selected pharmaceutical and personal care products within various soil textures in the vadose zone at the game land spray fields. This topic continues to receive important attention by current College of Agricultural Sciences students and faculty. An earlier senior thesis also looked at caffeine as a possible effluent tracer.

Recently, heavy metal occurrences below effluent-enhanced wetlands and control wetlands were investigated with unexpected results. Sources other than effluent also account for accumulation of metals detected in both treated and control wetlands. This interesting work was followed up by Matthew Fantle's student, Jared Carte '19g.

Only some of the students who contributed to the Living Filter project in one way or another are cited. My apologies to those who were omitted given the often-trying field conditions involved.

I am the only living and active member of the Office of Physical Plant's original Waste Water Management Committee formed in fall 1961. This was shortly after I arrived on campus without start-up funds or an office. There was much to be learned working on real-world geologic and environmental problems as a member of an interdisciplinary team, which was uncommon at the time. To many, applied work was not science. However, many of these students have gone on to stellar careers in academia, research, government, geological survey firms, regulatory agencies, national laboratories, and industry as owners or employees of consulting and oil companies. Today, interdisciplinary research—dealing with complex interactive earth processes and systems—is the norm and expected by many funding agencies. Our nation and the world face many vital challenges that require insights and knowledge provided by earth scientists. It is a joy and rewarding to be blessed with good health, supported by a loving wife and children, to work each day on interesting projects, and most of all, to reflect on the success of so many former students who are behind the name, Parizek Lane.

Scholarships & Awards
Undergraduate

Thomas F. Bates Undergraduate Research Enhancement Fund: *Corey Byerton*

Joseph Berg Award for Undergraduate Research in Geosciences: *Fairuz Hidayah Hasnan, Jacob Kaminski, Karhleen Shank*

Barton P. Cahir Award: *Albina Alzhanova*

Frank Dachille Memorial Award in Geochemistry: *Qianyi Lu*

David M. Demshur Undergraduate Research Endowment: *Nouff Alsaad, Lukman Asri, Alyssa Barr, Jason Beck, Corey Bryerton, Nicholas Crescenzo, Porraket Dechdacho, Michael Mulic-Gilbert, Derek Hendricks, Emily Hoyt, Matthew Leddy, Emily Loucks, Allison Richards, Morgan Richards, James Tierney*

Edwin L. Drake Memorial Scholarship: *Alexandra Shattier, Amir Aiman, Dion Furfaro, Donial Abdul Shukor, Elizabeth Block, Fairuz Hasnan, Faris Zaini, Fatin Baharudin, Heechan Ju, Iman Nasuhu Binti Rosland, Joey Grant, Junyin Xiao, Kaleb Griffiths, Martina Dundovic, Morgan Sawyer, Muhammad Nazan Yusri, Nuriffa Najib*

General Scholarship Endowment in Geosciences:

David P. "Duff" Gold Undergraduate Scholarship Fund: *Fatin Farihah Baharudin, Lindsey Jacks, Muhammad Faris Zafir Mohamed Zaini*

John C. and Nancy Griffiths Scholarship: *Daniel Keyes, Molly McHale, Emma Osenbach*

James and Nancy Hedberg Scholarship: *Nicholas Crescenzo, Eric Jordan, Yaolin Miao, Nuriffa Syahira Mohd Najib, Leah Motimaya, Junyin Xiao, Muhamad Nazmi Yusri*

Arthur P. Honess Memorial Fund: *Ashley Herceg, Danial Fitri Md Sukor, Christine Tamburri, Lukman Nurhakim Mohd Asri, Iman Nasuha Rosland, Amir Aiman Zaidy*

Benjamin F. Howell, Jr., Award: *Abra Gold, Matthew Leddy, Pan Zhuolai*

Kappmeyer-Isaacs Field Camp Award: *Eileen Reiley, Zachary Scobola*

Ronald A. Landon Endowment in Hydrogeology: *Alyssa Barr, Jason Beck*

Earle S. Lenker Fund for Field Studies in Geology: *Alison Richards, Alyssa Barr, Michael Mulic-Gilbert, Porraket Dechdacho*

Maureen and Dennis Maiorino Undergraduate Scholarship: *Christina Boutselis, Paul Pietrinferni, Katherine Suchanec*

Timothy and Cindy Mullen Scholarship in Geosciences: *Catherine Gagnon*

Reif Undergraduate Summer Field Camp Award: *James Tierney, Morgan Richards, Nicholas Crescenzo, Saraa Hawks*

Robert F. Schmalz Award: *Albina Alzhanova, Porraket Dechdacho, Cissy Ming, Sapol Raadnui, Xiaoyu Zou*

Julie and Trem Smith Family Undergraduate Scholarship: *Daniel Sanchez-Delgado, Catherine Gagnon, Abra Gold, Jared Llewellyn, James Pippin*

Daniel and Deborah Stephens First-Time Endowed Scholarship: *Matthew Bromley, Abra Gold, Raheel Hadi*

John and Elizabeth Holmes Teas Scholarship Fund: *Taylor Rosen, Nancy Weinheimer*

Dr. David E. Vaughan and Mrs. Julianne Vaughan Field Camp Fund: *Jason Beck, Derek Hendricks, Emily Hoyt, Emily Loucks*

Tim and Courtney Watson Undergraduate Scolarship: *Emily Loucks, Thomas Tran*

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Scholarships & Awards Graduate

Alley Family Graduate Scholarship: *Elisabeth Clyne, Emily Schwans*

Cannon Family Graduate Symposium Award in Geosciences: *Benjamin Barnes, Jacob Cipar, Joanmarie Del Vecchio, Troy Ferland, Allison Fox, Gabriella Harris, Xiaoni Hu, Kalle Jahn, Heather Jones, Allison Karp, Abby Kenigsberg, Rebecca Payne, Matthew Reinhold, Claire Webster, Timothy Witham, Gregory Wong, Clay Wood, Damaris Wyatt*

Chevron Scholarship: *Julia Carr, Guangchi Xing*

Charles E. Knopf, Sr., Memorial Scholarship: *Tsai-Wei Chen, Jacob Cipar, Julia LaFond, Collin Oborn, Mary Reinthal, Claire Webster*

The Michael Loudin Family Graduate Scholarship in Geosciences: *Benjamin Barnes, Mary Reinthal*

Krynine Memorial Award: *Benjamin Barnes, David Bolton, Cathleen Bressers, Claire Cleveland, Elisabeth Clyne, Joanmarie Del Vecchio, Troy Ferland, Gabriella Harris, Benjamin Hayworth, Kalle Jahn, Heather Jones, Allison Karp, Erica Lucas, Sierra Melton, Peter Miller, Mary Reinthal, Adriana Rizzo, Emily Schwans, Judith Sclafani, Andrew Shaughnessy, Srisharan Shreedharan, Elena Stiles, Claire Webster, Clay Wood*

Hiroshi and Koya Ohmoto Graduate Fellowship: *Si Chen, Andrew Shaughnessy*

Richard R. Parizek Graduate Fellowship: *Jacon Cipar, Clarissa Crist, Joanmarie Del Vecchio, Kalle Jahn, Lisa Ma*

Scholten-Williams-Wright Scholarship in Field Geology: *Jacob Cipar, Xiaoni Hu, Collin Oborn*

Shell Geoscience Energy Research Facilitation Award: *David Bolton, Julia Carr, Arnold Eatmon, Troy Ferland, Allison Fox, Xiaoni Hu, Peter Miller, Dorivaldo Santos, Srisharan Shreedharan, Clay Wood*

Richard Standish Good Graduate Scholarship: *Troy Ferland, Allison Karp*

Donald B. and Mary E. Tait Scholarship in Microbial Biogeochemistry: *Julia LaFond, Claire Webster*

Barry Voight Endowment: *Machel Higgins, Collin Oborn*

2019 Graduate Colloquium Awards

Oral Presentation by a Ph.D. Student (Post-Comprehensive Exam)

First: Allison Fox (Deines Lecturer)
Second: Allison Karp
Third: Heather Jones and Al Neely

Oral Presentations by a Ph.D. Student (Pre-Comprehensive Exam)

First: Benjamin Barnes
Second: Rebecca Payne
Third: Joanmarie Del Vecchio

Energy Related (Oral)

First: Troy Ferland
Second: Timothy Witham

Oral Presentation by an M.S. Student

First: Gabriella Rossetto Harris
Second: Jacob Cipar and Demaris Wyatt
Third: Matthew Reinhold

Poster Presentation (M.S./Ph.D.)

First: Greg Wong
Second: Xiaoni Hu
Third: Claire Webster and Kalle Jahn

Energy Related (Poster)

First: Abby Kenigsberg
Second: Clay Wood

These candidates were selected from an impressive group of participants. We would like to offer a special thank you to the Shell Corporation and the Cannon Family Fellowship for their continued support of the Graduate Colloquium.

2019 Trustee Scholarships & Endowments

Alley Family Graduate Scholarship in the Department of Geosciences
Arthur P. Honess Memorial Award
Baker Hughes Natural Gas Research Fund
Barry Voight Volcano Hazards Endowment in the College of Earth and Mineral Sciences
Barton P. Cahir Award Endowment in Earth and Mineral Sciences
Benjamin F. Howell, Jr. Award in Geosciences
Bruce Miller Scholarship in the College of Earth and Mineral Sciences
Cannon Family Graduate Symposium Award in Geosciences
Charles E. Knopf, Sr. Memorial Scholarship
Chesapeake Energy Corporation Annually Funded Scholarship in Geosciences
Daniel and Deborah Stephens First-Time Endowed Scholarship
David M. Demshur Undergraduate Research Endowment in Geosciences
David M. Diodato Geosciences Fund
David P. "Duff" Gold Undergraduate Scholarship Fund in Geosciences
Donald B. and Mary E. Tait Scholarship in Microbial Biogeochemistry
Dr. David E. W. Vaughan and Mrs. Julianne S. Vaughan Field Camp Fund in the Department of Geosciences
Earle S. Lenker Fund for Field Studies in Geology
Edwin L. Drake Memorial Scholarship
Frank and Lillie Mae Dachille Memorial Award in Geochemistry
Fund for Excellence in Lithospheric Geodynamics in the College of Earth and Mineral Sciences
General Scholarship Endowment in Geosciences
George L. Ellis Scholarship
Geosciences Enrichment Fund
Geosciences Research Fund In Honor of Hiroshi Ohmoto
Heller Marcellus Shale Research Initiative Endowment
Hiroshi and Koya Ohmoto Graduate Fellowship in Geosciences
James and Nancy Hedberg Scholarship in Geosciences
Janet C. Kappmeyer and Andrew M. Isaacs Experiential Learning Fund in Marine Sciences in the Department of Geosciences
Jesse A. Miller Trustee Matching Scholarship in the College of Earth and Mineral Sciences
John and Elizabeth Holmes Teas Scholarship Fund
John C. and Nancy Griffiths Scholarship in Geosciences
Joseph Berg Award for Undergraduate Research in Geosciences
Julie and Trem Smith Family Undergraduate Scholarship
Kappmeyer-Isaacs Field Camp Award
Kent and Helen Newsham Geosciences Endowment in the College of Earth and Mineral Sciences
Lattman Visiting Scholar of Science and Society Endowment
Maureen and Dennis Maiorino Undergraduate Scholarship in the Department of Geosciences
Michael G. Loudin Trustee Scholarship in the College of Earth and Mineral Sciences
Michael Loudin Family Graduate Scholarship in Geosciences in the College of Earth and Mineral Sciences
Newsham Family Undergraduate Scholarship
Open Flow Gas Supply Corporation Endowed Program Fund in Geosciences
Perez Family Undergraduate Scholarship
Petroleum Geosystems Enrichment Fund
Pottorf Endowment for Graduate Excellence in Geosciences
R.J. Cuffey Fund for Paleontology
RADS Equipment Fund for Field Studies in Penn State Sedimentary Geology
Reif Undergraduate Summer Field Camp Endowment
Richard B. and Cynthia R. Alley Faculty Enhancement Program Fund
Richard R. Parizek Endowment for Field Study in Geosciences
Richard R. Parizek Graduate Fellowship
Richard Standish Good Graduate Scholarship in the Department of Geosciences
Robert F. Schmalz Award in the Department of Geosciences
Ronald A. Landon Endowment in Hydrogeology
Rudy L. Slingerland Early Career Professorship in the College of Earth and Mineral Sciences
Scholten-Williams-Wright Scholarship in Field Geology
South Jersey Resources Group Endowed Program Fund in Geosciences
St. Mary Land and Exploration Endowed Program Fund in Geosciences
The Paul D. Krynine Memorial Fund
Thomas F. Bates Undergraduate Research Enhancement Fund for Geosciences in the College of Earth and Mineral Sciences
Thomas Kenneth (T.K.) Reeves, Jr. Family Scholarship
Timothy and Courtney Watson Undergraduate Scholarship in the College of Earth and Mineral Sciences
Timothy B. and Cindy Lynch Mullen Scholarship in Geosciences
Timothy D. Watson Fund in Geosciences

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Dr. Timothy S. White

Mr. Douglas J. Woodring

Note: This list is the compilation of contributiins received between July 1, 2018 through June 30, 2019.

Alumni News

John Ackerman '75
Ackerman was named the 2018 Engineer of the Year by the Lehigh Valley Section of the American Society of Civil Engineers and the 2018 Engineer of the Year by the Keystone Northeast Chapter of the Pennsylvania Society of Engineers. He also received U.S. Patent #10,071,918: "Water Harvester and Purification System."

James H. Anspach, PG (r) '77
Anspach was elected as a Distinguished Member of the American Society of Civil Engineers "for his exemplary thirty-eight-year career as a practitioner, educator, and researcher." He has worked for the benefit of the public and the engineering profession by fostering a dynamic evolution of the industry for the practice of subsurface utility engineering and the utility damage prevention profession.

Mildred Barylski '77
After graduation, Barylski went to graduate school at the University of Massachusetts Amherst and received her M.S. in geology in 1980, focusing on vertebrate paleontology. She worked for two years at the Pratt Museum of Natural History now named the Beneski Museum of Natural History, Amherst College, in the fossil collection and then moved to Virginia in 1982 to work at the Smithsonian Institution.

Charles Boyer '76
Boyer was elected for a three-year term on the board of directors of the Society of Petroleum Evaluation Engineers. He is currently a scientific adviser on unconventional reservoirs for Schlumberger, an international oilfield services company.

George Bureau '80
Bureau was recently promoted to vice president consulting services for Wisconsin Manufacturing Extension Partnership based in Madison, Wisconsin.

Greg Collins '13
Collins continued his education at the University of Pennsylvania and received his Ph.D. in education policy and is now employed at the Consortium for Policy Research in Education where he is investigating the relationship between teacher preparation pathways and STEM teacher attrition.

Martin Farley '80 '87
Farley received the 2019 Distinguished Service Award from AASP – The Palynological Society, which promotes all aspects of palynology in academia and industry.

Jim Gearhart '77
Gearhart has been retired from the water-resources discipline of the USGS for nine years and is enjoying mentoring seniors in the Earth & Environment Department at Franklin & Marshall College in Lancaster, Pennsylvania; researching and writing articles and a blog on local history; and spending time with his family at a vacation house in Deep Creek Lake in western Maryland. He says "hi" to all his alumni friends.

Mark Hainsey '83
Hainsey was recently named the chief knowledge officer for the U.S. Army Corps of Engineers, Washington, D.C.

Daniel Hummer '10
Hummer finished his third year as a faculty member at Southern Illinois University. He continues to collaborate on both the experimental aspects of mineral formation and utilizing large datasets to track the evolution of minerals over geologic time. This year he is wrapping up a four-year project, the "Carbon Mineral Challenge," which sought to unite academics and amateur collectors to predict and find new mineral species containing carbon. He was, recently asked to help design a new exhibit on mineral evolution for the American Museum of Natural History in New York City, a project that is still ongoing and he says has been an honor to be part of. Happily, during this past year he also got married to his beautiful wife and gained two wonderful stepdaughters. The family is now in the process of buying their first house together and planning for a bright future.

Don Schroder '78
Schroder currently sells print, digital, and video advertising for Popular Woodworking magazine and co-leads African photographic safaris to South Africa, Botswana, and Kenya with Magnum Excursions, headquartered in Allentown, Pennsylvania. To view photos from a May photo safari tour/workshop to the Zimanga Private Game Reserve in South Africa, visit Don Schroder Photography at https://www.donschroder.com.

Mike Weber '82
Weber worked at the United State Geological Survey and the U.S. Nuclear Regulatory Commission (NRC) for thirty-six years, before retiring in 2018 as the director of Nuclear Regulatory Research. From 2010 to 2015, he served as deputy executive director for Materials, Waste, Research, State, Tribal, and Compliance Programs, the second highest career staff position at the NRC. A 1982 Penn State geosciences graduate, he continued to apply his geosciences skills throughout his career, especially on high-level waste repository projects and on groundwater protection and environmental remediation. In 2015, Weber represented the NRC at the sixtieth anniversary celebration of Penn State's Breazeale Nuclear Reactor. He has returned to Pennsylvania and resumed his exploration of the geology of the Commonwealth, including serving as a tour guide at the Cornwall Iron Furnace and the adjacent ore banks.

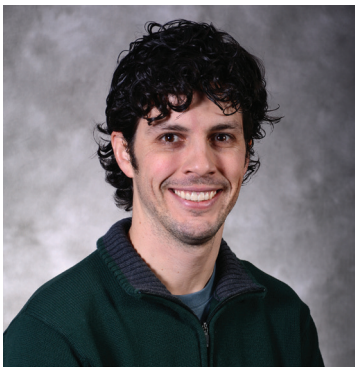
Faculty Awards and Recognition

Richard Alley

- Roosevelt "Rosey" Thompson Award
- Visiting Scholar of Phi Beta Kappa

Katherine Freeman

- Richard Owen Distinguished Alumni Award, Department of Earth & Atmospheric Sciences, Indiana University



Roman DiBiase

- NSF Career Award

Tanya Furman

- President-elect of the Education section of the American Geophysical Union

Maureen Feineman

- Wilson Award for Excellence in Teaching, Penn State College of Earth and Mineral Sciences

Klaus Keller

- Penn State Outstanding Postdoc Mentor Award
- Paul F. Roberson Award for Research Breakthrough of the Year, Penn State College of Earth and Mineral Sciences

PennState
College of Earth and Mineral Sciences

Department of Geosciences
The Pennsylvania State University
503 Deike Building
University Park, PA 16802

Alumni Passings

Mr. Charles E. Black ’56
Mr. Alan I. Brunstein ’43
Dr. John C. Crelling ’67
Mr. Joel A. Christine ’08
Dr. Thomas M. Davis ’55
Dr. Gerardo W. Gross ’59
Mr. Ronald E. Hicks ’71
Martin E. Horkey, Rev. ’84
Dr. Bruce R. Lipin ’75
Dr. Alvis L. Lisenbee, ’72
Mr. Stanley J. Luft ’51
Mr. Elliott B. McConnell, Jr. ’53
Dr. J. Donald Rimstidt ’79
Mr. Larry E. Shanabrook ’78